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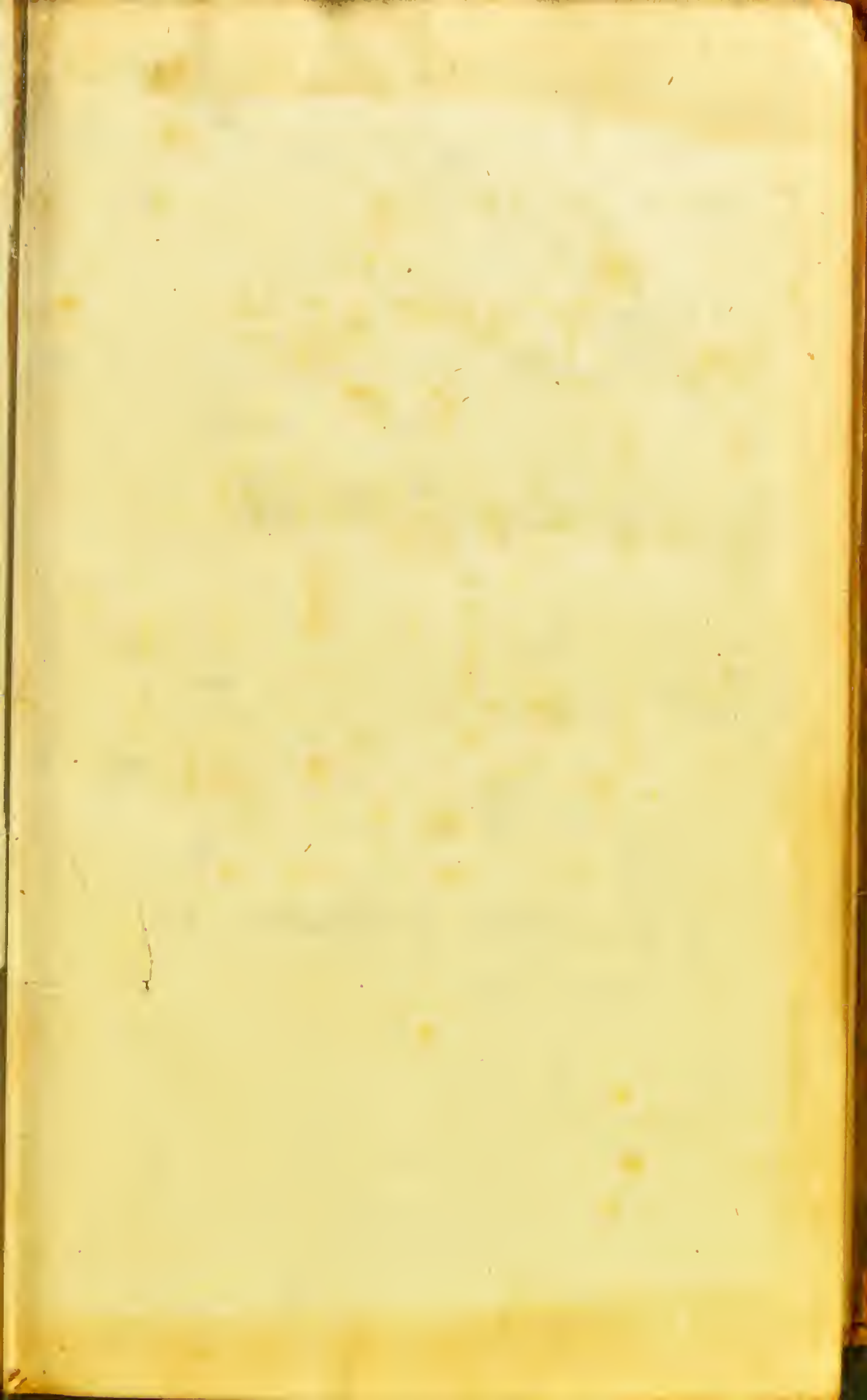


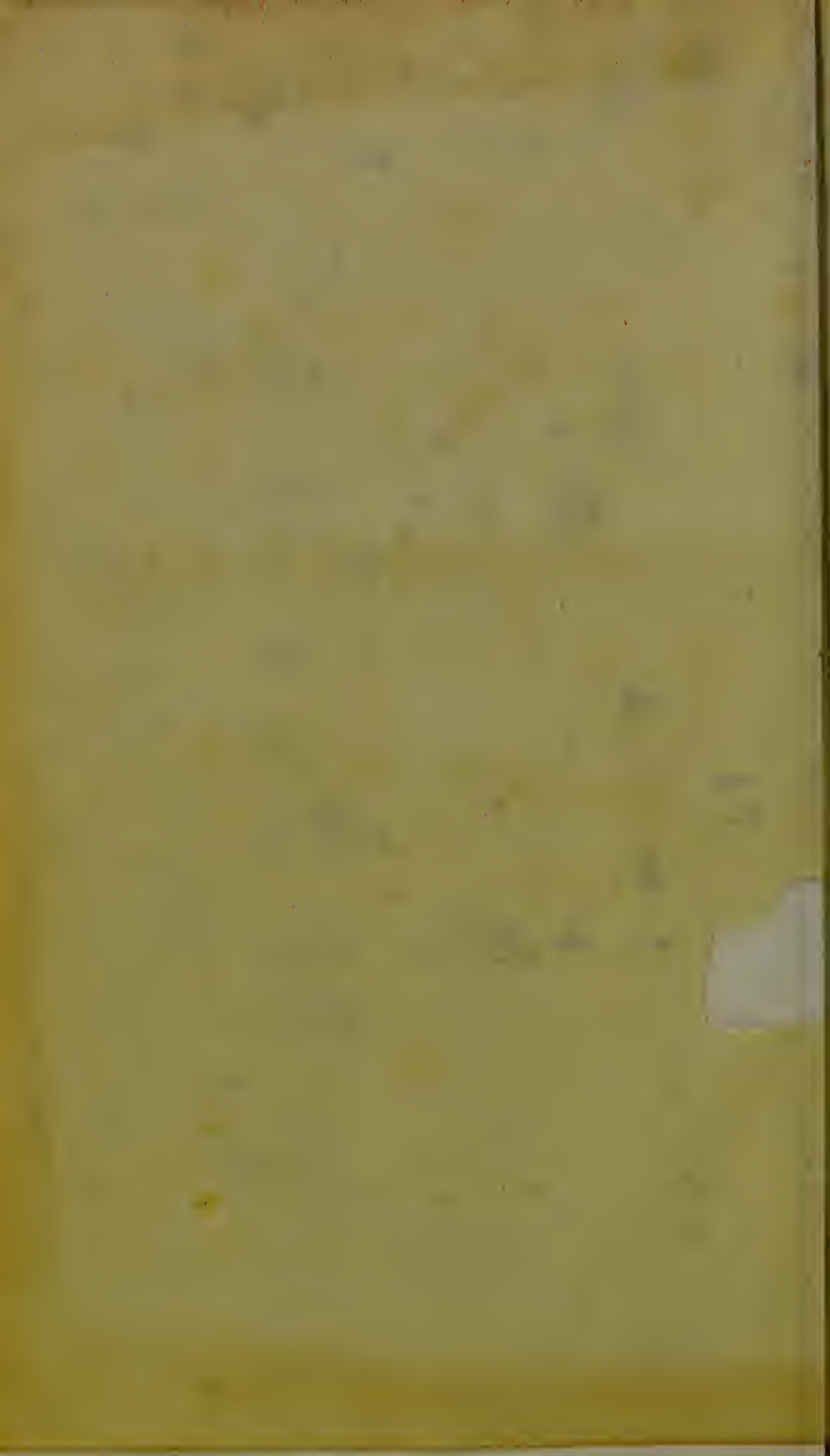
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A
T R E A T I S E
O N
MEDICAL AND PHARMACEUTICAL
C H Y M I S T R Y,
A N D T H E
M A T E R I A M E D I C A.

A
T R E A T I S E
O N
MEDICAL AND PHARMACEUTICAL
C H Y M I S T R Y,
A N D T H E
M A T E R I A M E D I C A:

TO WHICH IS ADDED,
AN ENGLISH TRANSLATION OF THE NEW EDITION
OF THE PHARMACOPOEIA OF THE ROYAL
COLLEGE OF PHYSICIANS OF
LONDON, 1788.

IN THREE VOLUMES.

V O L. II.

B Y
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the Royal Societies of London and of Edinburgh.

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C O N T E N T S

OF THE

SECOND VOLUME.

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ERRATA CORRIGENDA.

Page 109, line 2, for *aters*, read *waters*.

146, 7, for *carvy*, read *carraway*.

152, 2, for *two*, read *eleven*.

168, 7, for *three ounces*, read *two ounces*.

201, 5, for *gravellish*, read *gravelly*.

248, 13, after *resins*, put *mentioned*.

252, 18, for *hepar sulphuris*, read *sulphur*.

425, 19, for *enter*, read *enters*.

A. J. C.

The following is a list of the

names of the

members of the

committee

of the

association

of the

year

OF
PHARMACEUTICAL CHYMISTRY,
AND THE
MATERIA MEDICA.

CHAP. I.

SECT. I.

Of Water.

WATER is that colourless, transparent, unflammable fluid, so universally diffused over the face of the earth; and so common, that every body has a clear idea of it, on hearing its name.

It is in so constant use, not only for our drink, but also in preparing all our solid food, that it may be justly said to be the vehicle of all our nourishment; for it is not only mixed with it in the first passages,

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B

but

but it is taken up in this vehicle into the lacteal and lymphatic veins, and from thence carried through every vessel of the body.

It gives fluidity and mildness to the blood, and is the best menstruum for dissolving saline putrescent particles, and for carrying them out of the body by the different secretory and excretory organs, and by these means it proves the most universal remedy in nature, and useful in every disorder.

Hitherto we have not been able to find any water perfectly pure, or free from all heterogeneous mixture; for whether it passes through the air, or the bowels of the earth, it meets with numerous foreign bodies, which mix intimately and incorporate with it; however, in common we call that water pure or sweet which is clear or colourless, and has no sensible taste or smell.

It is commonly divided into two sorts:

1. The *meteoric*, or that which falls on the earth in form of dew, rain, hail, or snow.
2. The *terrestrial*, or that which runs on the surface of the earth, or passes through its body.

1. The

1. The *meteoric* water is made up of the humid vapours or exhalations raised from the earth, and condensed by cold into their pristine form ; and, when collected at a distance from large towns, where the air is not infected with sulphureous or other vapours, it is the sweetest and purest water which nature affords ; but even then is not exempted from all heterogeneous mixture, for we find it variously impregnated with whatever is found capable of floating in the atmosphere, with the small seeds of various plants, with the eggs of insects, and with the fine particles of earth and of other substances that are perpetually flying about in the air. Hence it is that the purest rain water constantly ferments and putrefies after long standing, especially in a warm place.

Mr. Marggraf *, in order to find out the contents of meteoric waters, distilled a hundred quarts of rain water, with a degree of heat less than that of boiling water ; and when it was reduced to six or eight ounces, he

* See Mémoires de l'Académie de Berlin, pour l'Année 1751, publié 1753, p. 131.

filtered it through paper, and got a hundred grains of a fine white calcarious earth. As he suspected that the filtered liquor contained an acid, he added to it thirty drops of a solution of very pure salt of tartar, in distilled water : and then, by evaporating, he got a small quantity of a salt resembling nitre, and then some cubic crystals of sea salt, both which were brown, and shewed a mixture of an oily matter ; and snow water, treated in the same manner, yielded sixty grains of a calcarious earth, and, upon the addition of an alkaline salt to the residuum, afforded more sea-salt than nitre.

Dr. Ratty mentions his having analysed rain-water, which was collected forty miles from Dublin, in an open place as free as possible from smoak, or other exhalations. On standing, it fermented, stunk, and deposited a flaky brown sediment, and then became sweet again.

A hundred and twenty-three gallons of this water, kept in a tub, deposited a black sediment like mud ; which, when dried, weighed two ounces six drams and two scruples, which was in the proportion of near
one

one grain and a half to each pint of the water; and, upon examination, he found it to be made up of an absorbent earth, a nauseous, bitter, brackish salt, part of which was a calcarious Glauber, and part a sea-salt, and an oily matter.

By evaporating some of the same sort of rain water, in glazed earthen vessels, with a gentle fire, he obtained nearly the same proportion of a dark brown-coloured residuum, which had a bitter, brackish, and sometimes a lixivial taste; and, on examination, it proved to be of the same nature as the sediment which the rain water, which had been let stand, had spontaneously deposited; and from eighty-five grains of this residuum he got thirty-six grains of salt, made up of calcarious Glauber and sea salt.

From experiments made by different people, it appears that rain water is differently impregnated in different countries, and in different places of the same country, according as the air, through which it passes, abounds with different vapours, or has different things floating in it; for which reason, in the vicinity of great cities and towns,

where the contents of the atmosphere are continually varying, in consequence of the manufactories, &c. it will be found to vary at every experiment.

From what has been said, it appears, that rain water, as it falls, is not free from heterogeneous mixture ; and that therefore, when a perfectly pure water is wanted for performing nice chymical experiments, that the water used must be distilled, which renders it much purer than any which nature affords.

The best method of doing this, is, to distil it in glass vessels, with a very gentle heat ; taking care not to raise the fire so much as to force over any of the foreign matter, with which it may be impregnated ; and if twelve quarts are put into the retort or still, to throw away the first quart that comes over, and continue the distillation till you have got nine quarts more, and then to finish the process ; leaving at least two quarts in the still. In this way a water is obtained purer than rain or snow water, or than any other water got by any other process hitherto known ; though still it is not

free from all heterogeneous mixture ; for Mr. *Boyle*, Dr. *Hoffman*, and other accurate observers, inform us, that if the purest water be ever so often distilled, that, upon being subjected again to distillation, it still leaves some small quantity of a fine earth behind.

When the distillation is finished, the distilled water ought to be kept in glass bottles well stopped with glass stoppers.

The purer water is, the lighter it is ; and the more apt it is to congeal or freeze ; and the sooner it is heated, and the sooner it is cooled ; and if perfectly pure, a solution of the vegetable alkali in distilled water mixes smoothly and easily with it, without causing the least turbidness or precipitation ; but if the water be impregnated with an earth, or iron, or copper, or other metallic substance, the water becomes turbid, and a precipitation ensues, on the alkaline solution being dropped into it.

It is a fluid quite incompressible by any means hitherto known : it has been put into hollow spheres made of different metals, and they have been beat by hammers, but

the water always transfused through the pores of the metal, as soon as the figures of the spheres were in any ways altered.

It always remains fluid while its heat is so great as to raise Fahrenheit's thermometer to thirty-three degrees ; but assumes a solid form, or freezes and becomes ice; in the open air, as soon as the quicksilver in the thermometer falls under thirty-two degrees. By heat, it evaporates in the form of a fine vapour ; it is capable of great rarefaction and extreme expansion, and its rarefied and confined vapour is capable of dissolving the hardest parts of vegetable and of animal substances, as we know by experiments made with Papin's digester.

Its specific gravity, to that of air, is commonly reckoned as 850 to 1, and to that of gold as 1000 to 19,640.

1. It is the proper solvent of all saline bodies, acid, alkaline, and neutral.

Some of the saline bodies increase its heat during the time of their solution, while others lessen it ; but the heat or cold, thus generated by the solution of saline bodies in water, lasts only till the solution is completed ;

pleted ; immediately after which, the water returns to the temperature of the atmosphere.

It dissolves only a certain quantity of any salt ; but. after it is fully saturated with it, it is still capable of dissolving a certain quantity of another ; and, when heated, it in general dissolves and keeps suspended, while it remains hot, a greater quantity of salts than when it is cold.

2. It mixes freely with ardent spirits ; but does not mix readily with sulphur or any sort of oil, without the addition of some saline body or of quicklime, or that it be deprived of fixed air, or be too fully impregnated with it ; though in the distillation of aromatic plants, and in shaking camphor or other essential oils with water, a small portion of the essential oils seems to mix with it, and to communicate their flavour, and somewhat of their taste to it.

It mixes with and dissolves all soaps, both acid and alkaline ; and it dissolves all mucilages and gums, and by their means it unites with oils, and suspends them in form of an emulsion.

It

It mixes with and dilutes all animal fluids ; it dissolves viscid mucus and phlegm, and is the best menstruum for dissolving wax in the ear.

3. It has no effect in dissolving any metallic substance except arsenic, unless it contains a superabundant quantity of fixed air, or it be impregnated with an acid, an alkaline, or a neutral salt, when it becomes a menstruum for any metallic substance which these salts are capable of dissolving.

4. It has no effect in dissolving any earths, except some of the calcarious kind, when reduced to the state of a quicklime ; or that it be saturated with fixed air, though the lighter earths are often suspended in it ; but when it is mixed with an acid, it is then capable of dissolving all earthy substances, to which such acid served as a menstruum.

Waters have been divided into *simple* and *mineral* : those being called simple, which have no sensible taste or smell ; and those mineral, which are remarkably impregnated with some mineral substance. Hitherto the exact boundaries between these two classes of

of waters have not been settled by authors ; but in general we may call that water *simple* which is pure, clear, and transparent, and has no sensible taste, and which mixes equally with soap, and does not become turbid on the mixture of a solution of a pure alkaline salt ; such water is commonly called a soft water, and is the most proper for the common uses of life. And we may call that water *mineral* which is hard, and curdles with soap, and becomes turbid, on adding a solution of an alkaline salt to it. Dr. Rutty says, that water begins to deserve the name of hard, or mineral, when it contains in the proportion of ten grains of a saline-terrestrial matter in the pint or pound ; that being the quantity that first gives it the properties of a hard water.

Some of the simple terrestrial waters are extremely pure, and yield by evaporation as little, nay less matter than rain water itself. Dr. Wall mentions his having evaporated three quarts of the water of the holy well at Malvern, in a silver vessel, and that no residuum was left that could be collected. Dr. Rutty says, that the water of
some

some of the wells at Dublin was as light as distilled water, and yielded but one grain of solid matter from the pint; and many such waters are to be found, particularly in the mountainous parts of this island. The purer water is, the more proper is it for the common uses of life, and for the preparation of medicines, and the more it has been esteemed for the preservation of health; and very pure water has been reckoned to be particularly useful for washing and bleaching linen, for drawing of tea, making of coffee, for baking fine bread, for boiling of pease and other soft legumes, and for extracting the gummous and nutritive mucilaginous parts from flour, oatmeal, and other farinaceous substances, and for boiling meat of all kinds.

The common hard waters, which are but slightly impregnated with a saline matter, have their uses; they are much employed in divers manufactures, in dying, in masons work, and for many other purposes; and some of them preserve remarkably the green colour of cale, pease and pickles; and they have

have been much used for crimping of cod and other fish.

Some of the waters which are hard, from being impregnated with an earthy or metallic matter, by means of fixed air or the aerial acid, become soft by mere boiling, or by exposing them for some time to the heat of the sun; for the aerial acid flying off, the water lets drop the earthy or metallic particles to the bottom, being no longer capable of suspending them; and all hard waters may be made soft, or capable of lathering with soap, by adding so much of a pure alkaline salt to them as is sufficient to precipitate their earthy or metallic matter, and to fully saturate their acid.

S E C T. II.

Of Mineral Waters.

WE already observed, that many waters were impregnated with mineral substances, which gave them a taste, smell, and other properties, different from those of simple water, and which from thence have been called *mineral*. These waters are impregnated with such mineral substances in their passage through the earth; and therefore we may lay it down as a certain rule, that fossil matters only can enter into their composition, and only such of them as are soluble in water, or soluble in it when joined to some saline body, either acid, alkaline, or neutral; or when it meets with bodies saturated with a large quantity of air, or which are intirely deprived of it.

The

The substances with which they have been found impregnated are :

1. <i>Air.</i> Pure Air. Inflammable Air.	5. <i>Earthy neutral Salts.</i> Vitriolated ab- sorbent Earth. Vitriolated Mag- nesia. Vitriolated calca- rious Earth, or Se- lenites. Vitriolated Clay, or Alum. Nitrated ab- sorbent Earth. Muriated ab- sorbent Earth. Muriated Mag- nesia. Aerated absorbent Earth.	6. <i>Inflamma- ble Substances.</i> Fossil Oil. Sulphur.
2. <i>Acids.</i> Fixed Air, or aerial Acid. Vitriolic Acid.		7. <i>Metallic Sub- stances.</i> Iron. Copper. Zinc. Arsenic.
3. <i>Alkalies.</i> Vegetable. Fossil. Volatile.		8. Heat, or Fire.
4. <i>True neutral Salts.</i> Glauber salt. Nitre. Sea salt.		

CHAP. II.

A I R.

SECT. I.

Common Air.

PURE or common air is contained in most waters, in the proportion of about one cubic inch in a hundred. This, when

when expelled by boiling or by the air-pump, is gradually recovered from the atmosphere, on the water being exposed to the open air.

S E C T. II.

Inflammable Air.

THIS species of air is only found in some few waters which are mixed with some of the finer species of the fossil oils; the mixture of air with the fine particles of these oils renders them extremely volatile, and they fly off in form of a fine vapour, which catches flame when a candle is brought near their wells. Sir T. Bergman says, that this species of air is not united with the water, but rises from the bottom, and is expanded on the surface.

A C I D S.

S E C T. I.

Vitriolic Acid.

TH E vitriolic is the only acid that hitherto has been found pure and unmixed with alkaline or earthy matter in waters; and that mostly in places near to volcanoes, where it should seem to be distilled from mines of vitriol or of pyrites-stone decomposed by subterraneous fire. Dr. *Vandellius*, in his treatise *De Thermis Agri Patavini*, published in the year 1761, mentions a cave near to the town of Latera, which is about thirty miles from Viterbo, in which a clear acid water drops from the crevices of the rocks, and is collected by the country-people in glazed earthen vessels; it has a mild acid taste, and by chymical experiments was found to be a true vitriolic acid diluted with much water. The country

people dare not enter this cavern but in winter, or when it blows a north wind, for at other times they are in danger of being suffocated. *Theophilus Griffonius* mentions a similar native vitriolic acid water that is brought to Sienna from a place near to the town of Selvena, which is about forty-six miles from it. And Varenius, in his *System of Geography*, says, that there is a spring in the province of Nota in Sicily, the water of which is so sour, that the people use it for vinegar. The water in some waste coal-pits tastes sour, and effervesces with alkalies, but has not hitherto been particularly examined, so as to know whether it contains a pure vitriolic acid, or a vitriol with a superabundant quantity of acid.

The acid of the dews collected in the East Indies, as I mentioned when treating of acids, is alleged to be of the vitriolic kind, and probably gives an acidity to some of the waters in the places where it falls.

Though we meet with this acid but seldom by itself in waters, yet it is very com-

mon

mon to find it combined with other substances; sometimes with the fossil alkali, at other times with iron, copper, or zinc, and very frequently with earths of different sorts; but of these more hereafter.

S E C T. II.

Nitrous, muriatic, and vegetable Acids.

THE *nitrous* and *muriatic* or *marine* acids have not hitherto been found pure, or even superabundant, in any mineral water, though they have been found united to alkaline salts and earths; and the *vegetable* acids, not being mineral substances, cannot enter into the composition of mineral waters.

S E C T. III.

Aerial Acid, or fixed Air.

THIS air or acid is found almost in every water, but in very unequal proportions ; for in some waters its bulk does not exceed that of a hundredth part of the water, in others it is equal to that of the water itself.

It gives an agreeable pungent, acidulous taste to water ; and has been proved, by incontrovertible experiments, to be the genuine *mineral spirit* that gives character and life to cold mineral waters.

When it was first discovered, it was only looked upon as a particular kind of air endowed with certain properties ; but by the experiments since made by Sir T. Bergman, the honourable H. Cavendish, Mr. Power, and others, it has been discovered to be a particular species of acid, that has all the
properties

properties of other acids. It turns syrup of violets, and other blue vegetable tinctures, of a red colour. It has a pungent acidulous taste; it acts on earthy and metallic substances; it renders both the fixed and volatile alkalies mild, and capable of crystallization; it unites with caustic calcarious earths, and produces those crystals called dog-tooth spar; and it has a less degree of affinity with alkaline, earthy, and metallic substances, than the other acids, and it is dislodged by them.

A number of years ago the late ingenious and reverend Dr. Stephen Hales had found, that the calculi generated in the human bladder, and the common alkaline salts, contained a large quantity of fixed air. In the year 1756 Dr. Black discovered, that limestone and other calcarious earths became soluble by being deprived of air: and some years afterwards, Dr. Macbride, on making experiments with lime-water, found, that although the addition of a small quantity of fixed air made the water drop its earth, yet when a superabundant quantity of it was added to the water, it recovered its

solvent power; and dissolved again the earth. In the year 1755 the late Mons. Venel published, in the second volume of the *Mémoires des Sçavans Etrangers*, an account of an analysis of the Seltzer waters; in which he proved, that the mineral spirit which gave the brisk acidulous taste to mineral waters, and kept dissolved and suspended some of their solid contents, was only a superabundant quantity of fixed air, by making brisk acidulous waters resembling in taste, smell, &c. those produced by nature. And Mons. Lafonne, in the account of his analysis of the baths at Vichy, published in the *Mémoires* of the Academy of Sciences at Paris, for the year 1757, proved that iron and earth were suspended in these waters by means of fixed air; all which has since been confirmed by Mons. Le Roy, in his *Tractatus de Naturâ et Usu Aquarum Mineralium*, published in 1762, and by the honourable Henry Cavendish, Messieurs Lane and Priestley, in the *Philosophical Transactions*, Volumes LVII. LIX. and LXII. for the Years 1767, 1769, and 1772.

Since

Since the publication of these works, Dr. Dejean of Leyden, on trying experiments with the waters of Aix la Chapelle, has suspected that their sulphur was suspended by the same means; for in a letter he wrote to me, dated the 20th of June, 1777, he says, “ Having been lately at Aix la Chapelle, I mixed a solution of arsenic in the marine acid, with some of the water in the Emperor’s Bath, and immediately a true and genuine sulphur was precipitated, in form of powder, to the bottom of the vessel in which the water was contained; which convinced me that the sulphur was dissolved by means of fixed air; though Sir Torbern Bergman thinks otherwise, and that the sulphur is suspended by means of phlogiston, and the matter of heat united in the waters; and he says, that if the concentrated nitrous acid be added to these waters, it seizes the phlogiston, precipitates the sulphur, and takes away the hepatic smell.”

The cold medicated waters, which possess peculiar power and efficacy, contain a much larger quantity of aerial acid than the common waters, and in general their excellency

is chiefly derived from it ; however, they are seldom or never without mixture of other saline substances, from which their peculiar effects are specifically determined, although even these are certainly vivified and receive more active and penetrating power from it. And many of the hot waters, such as the Caroline Baths in Bohemia, abound with this aerial acid.

Pure water may be impregnated with this aerial acid alone ; but whether any such water is to be found native, I cannot say, as water thus impregnated is a menstruum for iron and different sorts of earth, and therefore is likely to act upon some of these substances in its passage through the earth. There are indeed many waters in Germany, particularly near to the Rhine, which are so highly impregnated with this aerial acid, that their springs or wells are called Saur Brun, and the waters are esteemed by the inhabitants of the country to be otherwise pretty pure ; but I do not know that they have been all so particularly examined by chymists, as to determine whether any of them be free from other impregnations,

Pure

Pure water may be impregnated with aerial acid, either,

1. By mixing any mild alkaline salt with it in a large narrow-necked glass vessel, and then by adding to it a sufficient quantity of any of the common acids to saturate the alkaline salt, and shutting immediately the mouth of the vessel to confine the aerial acid, disengaged from the mild alkaline salt, and to allow it to incorporate with the water.

2. Or by conveying into water pure aerial acid disengaged from fermenting substances, or from chalk or mild alkaline salts, on the addition of some of the vitriolic acid, by means of different contrivances invented for the purpose.

By the first method, the aerated water is impregnated at the same time with the neutral salt, formed by the acid and alkaline salt employed. By the second method, the water is only impregnated with the pure aerial acid.

The aerial acid, as we before observed, not only gives the brisk acidulous taste to waters,

waters, but likewise dissolves iron and earth of different sorts. The iron, in the generality of brisk chalybeates, called acidulæ, such as the Islington, Tunbridge, the Spaw, the Pyrmont, &c. and likewise in the purging Cheltenham, and in the Bath and other waters, is suspended by means of fixed air, and precipitates as soon as that evaporates.

In some few waters, only a small portion of the iron is kept suspended, by means of fixed air, the rest being dissolved by a heavier and more fixed acid; as it is in the waters in the parish of Denmark, near Upsal, in Sweden; in the water of Hertfell, in the county of Anandale, in Scotland; and in the water at Sunning Hill, in the county of Berks, in England, &c.

Earth is suspended, by means of this same aerial acid in the water of the Baths at Vichy; in the brisk acidulous water of Seltzer; in the water of many petrifying springs, and in great numbers of waters in every country.

Its existence as a solvent in waters, shews itself by such waters dropping, in a very short
time

time after being exposed to the open air, the iron or earth that was dissolved in them, being no longer able to suspend them after the aerial acid is evaporated.

ALKALINE SALTS.

S E C T. I.

Vegetable Alkali.

THE *vegetable alkali* has been generally looked upon as an artificial production, and therefore was not expected to be met with as an ingredient in mineral waters; but some late authors seem to think that it is a native salt, as well as the fossil alkali, for Mr. Marggraaf mentions his having got a true nitre, the basis of which is the vegetable alkali, from some waters at Berlin; and Mons. Monnet says, that in analyzing the Pohoun Spaw water, he got eight grains of a gray-coloured alkaline salt, from a residuum of twelve Paris pints of the water, which he saturated

saturated with the vitriolic acid; and on diluting, evaporating, and crystallizing, he obtained a tartarus vitriolatus, and not a Glauber's salt as he expected. Dr. Hoffman alleges, that he obtained a tartarus vitriolatus by evaporating the Seltzer water; but it is probable that he had committed some mistake, as none of those chymists who have analyzed it since his time have met with any such salt. If the vegetable alkali is a native salt, it probably will be found in many waters, where at present it is not suspected.

The fossil Alkali. Many waters in Hungary, Tripoli, Egypt, and other countries, where this salt is found native, are impregnated with it; and by evaporating, some of them yield only a pure natron, while others yield both a natron and a Glauber's salt.

This alkali is combined with the aerial acid in the Seltzer and other acidulous waters, and it is often found pretty pure in the solid matter obtained from them by evaporation, the aerial acid having been dispelled by the force of the heat employed. Monsieur Monnet says, that he has procured it pretty pure from some of the waters in Auvergne;
but

but for the most part it was in an imperfect state in mineral waters, and may be rather called an embryo than a perfect salt, for it would not crystallize, and made a very bad neutral salt with acids, and was not capable of decomposing the selenites, and therefore was often found combined with it in the same water. Sir T. Bergman says, that authors speak of a certain imperfect mineral alkali, but observes, that all of that sort, which he had an opportunity of examining, appeared to him to be no other than a genuine alkali, but impure, and mixed with deliquescent salts.

This alkali has been found so intimately united with a phlogiston in some mineral waters, near to volcanoes, as to be capable of producing a true Prussian blue, on the addition of a solution of silver, or of green vitriol, to the water; of which Dr. Nichola Andrea gives an example in the thermal waters, of the spring, called Olmitello, in the island of Ænaria or Ischia.

The volatile Alkali. Dr. Hoffman, and most other late chymical authors, have very justly rejected the volatile alkali, as an ingredient

gradient in mineral waters, it being no fossil matter; though some few have thought differently, and alleged that sometimes marks of a small portion of a volatile alkali have been observed in some waters. And Monsieur Burette, in proof of this, tells us, in the Memoirs of the Academy of Sciences for 1717, that blue paper stained red with spirit of vitriol, recovered its blue colour by being put over the fountain of *la Grille*, at Vichy; and Dr. Henkel in his account of the Lauchstadt waters, in his *Bethesda Portuosa*, seems to insinuate, that he had traced some vestiges of a volatile alkali in them; and in the account of the hot waters at *Porretta*, we are told that a small quantity of sal ammoniac was got by subliming some of the sludge found at the bottom of their basins. From what we know, it does not seem probable that this alkali subsists naturally in mineral waters; though it is not impossible but that waters near to volcanoes, which have stood in the open air till they have become putrid, or been mixed with putrid vegetable or animal substances, may give some marks of their containing a volatile alkali; and we know that

some waters in great towns, where there is such a quantity of putrid excrement and other corrupted substances, have been found impregnated with it, as was the case of the Rathbone-Place water, examined by the honourable Henry Cavendish.

NEUTRAL SALTS.

S E C T. II.

*Vitriolated vegetable Alkali, or Tartarus
Vitriolatus.*

I HAVE already mentioned, that Monsieur Monnet has affirmed, that he had got a small pittance of the vegetable alkali from the residuum of Spaw water, and other authors have alleged that they have got it from the waters of other springs; therefore, if this should prove to be a native alkali, it is certainly possible that a tartarus vitriolatus may be found in some water or other; though hitherto none such have been discovered. Dr. Hoffman should seem to have

have committed a mistake, when he thought that he had got this neutral salt from the Seltzer waters, for neither Monsieur Venel, nor any of the other chymists, who have since analyzed that water, have been able to find any such salt in them.

Vitriolated fossil Alkali, or Glauber's Salt.

Many waters have been discovered, which contain a pittance of this salt, though but few which contain it in quantity. Monsieur Boulduc, in the Memoirs of the Academy of Sciences at Paris for the year 1724, mentions the water of a spring in the neighbourhood of Vaccia Madrid, which is a village about three leagues from Madrid, the capital of Spain, which yields by evaporation a salt, which, on repeated trial, proved to be a true Glauber's salt; and he says, that the salt concretes, on the borders round this spring, into crystals resembling the icicles which hang from the lower edges of the roofs of houses in the time of frost in winter. And in the Memoirs for the year 1727, he mentions his having analyzed a salt found by some miners who were digging for copper near to Grenoble in Dauphiny, which on examination

tion proved to be a true Glauber salt, like to that obtained from the Spanish mineral water at Vaccia Madrid.

Dr. Nicola Andria, in his treatise *della Acque Minerali*, published at Naples in the year 1774, says, that there is a water at Sellia in Calabria, which he found to contain a true Glauber salt in such quantity, that he thinks it would be worth while to prepare it from thence. And Mr. Pazmand, in his treatise on the Natron or Fossil Alkali of Hungary, mentions, that in evaporating the waters of the lakes of Peison and of Bogod, near to the city of Stulvveiffenburg, and other waters in the neighbourhood, in order to obtain the fossil alkali, that he got two sorts of salts; one a natron, the other a true Glauber salt. Many more instances might be brought of waters containing this salt being found in different parts of the world; but these are sufficient to prove that it is an ingredient with which they are often impregnated; and it is probable that such waters may be found to be frequent in countries which abound with the fossil alkali.

Nitrated vegetable Alkali, or common Nitre.

In treating of nitre, I mentioned, that the earth in certain barren places in the province of Bengal was so highly impregnated with this salt, that it tastes of it, and its surface is covered with a saline crust, which looks like a hoar frost; and that the nitre is prepared by lixiviating the earth in these districts; and the waters in these particular places are highly impregnated with it.

Mr. Margraaf, in the Memoirs of the Academy at Berlin for the year 1751, mentions his having obtained a small quantity of nitre from the waters of some of the fountains of Berlin; and Dr. Home of Edinburgh, in his Essay on Bleaching, says, that he obtained a nitrous earthy salt from some hard waters in Scotland; so that it is probable that other springs impregnated with a nitrous salt, may hereafter be discovered, especially in or near to great towns. Hitherto no water has been discovered in Europe which is so much impregnated with nitre, as to be used medically on that account.

No nitrated fossil alkali, or cubic nitre, has as yet been found in any water, though
it

it is not impossible but that such may exist in Bengal, or other hot countries where nitre abounds; if the earth in the neighbourhood be impregnated with a fossil alkali.

Muriated fossil Alkali, or Sea Salt. No salt is so universally diffused over the globe as this; the sea abounds with it: salt springs are frequent in most countries; and many waters every where, which do not taste salt, contain more or less of it.

Aerated fossil Alkali. The fossil alkali is so combined with the aerial acid in the Seltzer, and many other brisk acidulous springs of the same kind in their natural state, as they rise from their springs, that it covers entirely the taste of the alkaline salt; and in this state justly deserves the name of a neutral salt; though when these waters are evaporated, and the fossil alkali got thereby contains no more air than is sufficient to keep it in a solid form, it is then commonly called mild fossil alkali.

S E C T. III.

Neutral earthy Salts.

WATERS, in their passage through the different strata of the earth, dissolve the native earthy salts they meet with; or if they be first impregnated with acids of any kind, they dissolve such earths as are soluble in them.

The earths which have been found dissolved in waters by means of acids, are,

1. Limestone or calcarious earth; 2. Magnesia; 3. Absorbent earth; 4. Clay.
5. Sir T. Bergman has added the Terra ponderosa or Tungsten; but as he has given no instance of its being found in any water, I shall pass it over without further notice.

Vitriolated calcarious Earth; called *Selenites* or *Gypsum*. Limestone and other calcarious earths, dissolved in the vitriolic acid, form that sort of earthy salt called selenites or gypsum; which is very common to be met

met with in mineral waters ; it was for a long time taken for a simple earth or stone, from its being so difficult to dissolve in water, it requiring seven or eight hundred times its own weight of water to dissolve it ; though Dr. Rutty says, that water in which it is originally found, is capable of keeping four or five times that quantity of it suspended. When water containing it is evaporated, it either concretes into long small crystals interwoven one with another, or forms itself into small thin lamellæ, like the *sal sedativus*. If it is dissolved in a large quantity of water, it may be decomposed by precipitating its earth by the addition of an alkaline salt. It does not calcine to lime, the heat of the fire not being able to dislodge its acid, though it reduces it to the state of a calx or cement, fit for forming plaster. Chymists have not as yet ascertained whether there is only one or many species of selenites, or whether the varieties we observe are not owing to foreign mixture : if the calcarious earths are all of the same nature, there is but one sort of selenites, but if they are different, there are certainly many. A great number of mi-

neral waters, such as the Cheltenham, the Nevil Holt, the Somerſham, the Pyrmont, &c. contain a pittance of this ſalt; but I know of no mineral water which is preſcribed for health, where, this is the principal impregnating ingredient, nor is it one of thoſe ſubſtances which is conſidered as a medicine.

Vitriolated Magnesia, or Epsom Salt. Sir Torbern Bergman, and ſome other of the more modern chymiſts, have reduced all the purging vitriolated earthy ſalts, formerly called calcarious nitrates, or calcarious Glauber ſalts, which are got from mineral waters, under this head; alleging that, when they are properly purified, they all prove to be compoſed of magnesia united to the vitriolic acid. How far, ſtrictly ſpeaking, this may be true, I ſhall not ſay; but many appearances and circumſtances obſerved with regard to them, made former analyzers of mineral waters think that there were many different kinds of them; for the ſalts obtained from different waters by evaporation, ſhoot into cryſtals of different forms, and theſe cryſtals require different quantities of water to diſſolve them. The factitious Epsom ſalt
diſſolves

dissolves in little more than an equal weight of water ; and Dr. Short and Dr. Rutty have both found that the calcarious nitres, as they call them, or the purging salts got from mineral waters, take from ten to eighty times their own weight of water to dissolve them. If the true magnesia is the basis of all these salts, and the seeming different properties they have depend on various mixtures and combinations, then, strictly and chymically speaking, they are virtually the same sort of salt ; but if the different appearances and different properties are owing to the vitriolic acid being united to different sorts of absorbent earths, then each different earth will form a different neutral salt. An accurate chymical examination of the salts of a great number of mineral waters can only determine this question.

There are a great number of purging waters containing salts of this kind in different parts of England. These salts are seldom found by themselves in waters, but generally mixed with sea salt, with iron, with earth, and with sulphureous and other matter. The Dulwich water contains about 90 grains, and

as much sea salt, and a pittance of earth in the gallon; while the Stoke or Jessop water, three miles from Clairmont in Surrey, which is a weak chalybeate, but a strong purging water, contains, by the late Rev. Dr. Hales's account, near eleven drams of this salt in the gallon, that shooted into fine large crystals, which preserved their solidity and firmness longer than the salts of the Cheltenham waters.

Dr. Rutty says, that in examining waters at Dublin, he found that they commenced to be laxative, when they contained ten grains of this salt in the pint, or eighty in the gallon.

Vitriolated argillaceous Earth, or Alum.

The vitriolic acid united to a certain bole or clay, forms that sort of earthy salt called alum. It was looked upon as a very common ingredient in mineral waters about a hundred years ago; though since that time Dr. Hoffman, and other authors, have doubted, whether it was to be got in any natural mineral water; and indeed, the instances of waters in which it has been proved to exist, are but very few; the martial vitriol, which
gives

gives a sourish austere taste to water, having been often mistaken for it. Dr. Layard, in his account of the Somersham chalybeate water in the county of Huntingdon, given in the 56th vol. of the Philosophical Transactions, mentions, that it contains alum; and that Dr. Morris got five grains of regular crystals of alum from two pounds of this water. Dr. Ruttty suspects, that the mineral water at Ballycastle, in the county of Antrim in Ireland, contains a pittance of it; and it is probable that other waters containing it may hereafter be discovered.

Nitrated absorbent Earth. In looking over such of the late Histories of Mineral Waters as have come to my hand, I have not been able to find one accurate account of nitrous acid having been found united to earth, in any water that has been examined, except that given by Dr. Home, of Edinburgh, in his Essay on Bleaching, p. 4, sect. 2d; though Sir T. Bergman has marked both nitrated lime and nitrated magnesia amongst the ingredients found in mineral waters. It is not at all improbable, but that both these salts, and likewise cubic nitre, may hereafter

after be found in Bengal, and other countries which abound with true nitre. What Dr. Home says on this subject is, that he, in order to discover the contents of some hard waters, had added a fixed alkaline lixivium to soften them, and that he had then evaporated the water and crystallized the salt, which proved to be a true nitre by every trial. He says, that he believes the hardness in many waters to be owing to an imperfect salt, compounded of a nitrous acid and an absorbent earth.

Muriated calcarious Earth. The muriatic or marine acid joined to lime or other calcareous earths, forms an earthy salt of a very deliquescent nature, which is often mentioned as an ingredient in mineral waters, though there are but few instances given of its having been found in them. Sir T. Bergman says, that he got half a grain of this salt from the solid contents left, after the evaporation of a kanne of the acidulous water of Medway, in the province of Ostro-Gothland, in Sweden. And I myself obtained some of this salt from the salt water of a spring at Pitkeathly, which is six miles from the town

town of Perth, in Scotland: after I had separated the sea salt, and evaporated the residuum to dryness, I let it remain in the evaporating glass, and it run per deliquium; the night following being very cold, a crystallization took place, and there formed, amidst a bittern, crystals exactly resembling those which, Monsieur Morveau says, the muriated calcarious earth shoots into: the day following being warm, the crystallized salt dissolved again in the bittern; and on dropping the vitriolic acid into this ley, crystals of selenites were precipitated.

Muriated Magnesia abounds in sea water, and in the waters of many of the salt springs in England. It is the salt which principally saturates the ley that remains after the salt is evaporated. It is of a very deliquescent nature, and is scarce to be crystallized.

Aerated calcarious Earth, and aerated Magnesia. Monsieur Lefsonne, in the Memoirs of the Royal Academy of Sciences for the year 1753, gives an account of the waters of the Baths at Vichy, and proves that an alkalized earth and iron were suspended in them by means of fixed air. The
Honourable

Honourable Henry Cavendish, in the year 1757, proved that a calcarious earth was suspended in the water of a spring in Rathbone-Place in London, by the same means; and Sir T. Bergman, that both calcarious earth and magnesia were dissolved and kept suspended in the same manner, in the Spaw, the Pyrmont, and the Seltzer waters. This aerial acid or fixed air is of a very volatile nature, and evaporates when waters, containing it, are exposed to the open air for any time, or are boiled in an open vessel; and hence the brisk acidulous waters lose their spirit, and let drop iron or earth that is suspended in them by it, if let stand in unstopt bottles; and tea kettles in which waters, impregnated with earth by means of fixt air, are often boiled, become covered in the inside with an earthy crust; and substances thrown into wells of such waters are in time covered with an earthy or strong coat, and become, as it is commonly termed, petrified; from the minute earthy particles insinuating themselves into their pores, and covering their surface, while their figure is preserved.

Earth

Earth is alleged by some chymists to be suspended in some waters by means of common air, of which all water contains a portion; and others think that water itself is capable of dissolving a certain quantity of it; but the general opinion is, that neither pure air nor pure water is capable of dissolving earth; but that the small quantity of earth which is found in such waters is suspended, but not dissolved.

S E C T. IV.

Of metallic Salts.

FORMERLY, before mineral waters were subjected to chymical experiments, every metal was supposed to be contained in some water, or other; and the water situated near its mines was believed to be impregnated with the metal of the mine in its neighbourhood; but Dr. Hoffman very justly observes, that no metals are soluble, or can possibly enter into the composition of waters, unless the metal be first dissolved or turned into a salt; and that hitherto no salt of gold, of silver, of lead, of tin, of antimony, &c. has been found in the bowels
of

of the earth, nor any water impregnated with them.

The only metallic substances, which have hitherto been found dissolved in waters, are, *Copper, Iron, Zinc, and Manganese.* *Arsenic* indeed has been alleged to be contained in some waters; but this has not been proved by certain chymical experiments.

Vitriolated Copper. Copper has not been found dissolved in waters by any other acid than the vitriolic; and that mostly in waters which come from copper mines. Dr. Ratty mentions two such waters, one at Ballymurtoch, the other at Cronebaun, both in the county of Wicklow in Ireland; and one that rises from a copper mine in Pennsylvania in North America. In the Philosophical Transactions, No. 450, there is an account of another of the same kind at Neusol in Hungary; and others are mentioned by Count Marfigli in his History of the Danube, in Dr. Brown's Travels, and in other books.

Such waters become of a sapharine blue colour when mixed with the volatile alkali, and they immediately attack iron when
thrown

thrown into them; and as they dissolve the iron, they let drop their copper.

Waters impregnated with copper are emetic and purgative: and as they are seldom or never used either for the preservation or restoration of health, I shall take no further notice of them.

Vitriolated and aerated Iron. Iron is often found united with water, either by means of the vitriolic or of the aerial acid, or of both.

1. Those impregnated with it by means of the vitriolic acid, have been called *vitriolic waters*; they preserve their chalybeate qualities long, and yield a sal Martis if evaporated in large quantity with a gentle heat; of this kind are the *Shadwell* waters, situated two miles below the Tower of London: the *Westwood* water, near *Tandersley*, in the county of Derby; the *Hart-fell* water, in the county of Anandale in Scotland; the *Crosstown* water, near the town of Waterford in Ireland; besides many others, situated in different parts of the three kingdoms, and in France, Germany, and in other countries.

Are

Are waters ever impregnated with a volatile vitriol, as has been mentioned by many authors who treat on mineral waters? No fact has ever as yet been produced to prove the existence of such a vitriol, that I know of, unless we admit the following to be so. In the year 1768, an ingenious author, who does not put his name to his work, published at Rome, in 4to, a treatise *delle Terme Porrettane*, in which, amongst other curious facts, he tells us, that he fixed a glass receiver to the mouth of a hole, through which the vapour of the water, in the aqueduct below, rises constantly; and that at the end of a month he found in the receiver, and in the mouth of the hole, a concrete and incrustated substance like stalactite, which, on examining, he proved by experiments to be a true vitriolum Martis, in which the vitriolic acid was prevalent; from hence he concludes, that this water, as it rises from its spring, is impregnated with a fine volatile martial vitriol, which is in such small quantity as not to be discovered in any quantity of water that can be contained in common retorts or stills, but is demonstrated by confining for a long time
the

the vapour which is naturally and constantly sublimed from the whole body of the thermal water that is discharged from the spring, as it passes through its aqueducts. The water of this spring is strongly sulphureous, and its heat raises the quicksilver of Fahrenheit's thermometer to 92 degrees.

2. Those impregnated by means of the aerial acid or fixed air, which have commonly been called *chalybeates* or *acidulæ*. As taken up from their fountains, they have a brisk acidulous taste, which they soon lose, and let drop their iron if they stand in the open air; owing to the aerial acid, which gave them the taste and suspended the iron, being of a very volatile nature and evaporating. Of this kind are the Islington, the Tunbridge, the Peterhead, the Spaw, the Pyrmont, and innumerable other waters to be met with in most countries in Europe.

Vitriolated Zinc. Zinc, united to the vitriolic acid in form of white vitriol, has been found in the bowels of the earth; and authors have mentioned it, as an ingredient found in mineral waters, though none of them have hitherto given clear and certain

proofs of its existence in them ; unless we admit that salt to be true white vitriol, which Dr. Rutty describes as such, and affirms to have got from several waters in Ireland, that at the same time were impregnated with iron and other matters ; or that Dr. Gmelin met with it in the Teinach water, as he mentions in his treatise *De Acidulis Teinacensibus*.

Muriated Manganese. The Manganese (a new-discovered metallic substance) is mentioned by Sir T. Bergman as an ingredient in mineral waters ; he says, that it has been found salited, and that probably it may be met with both aerated and vitriolated ; and Mr. Scheel, in his *Prælectiones Chemiæ*, observes, that the celebrated P. J. Hyelem had discovered waters loaded with salited Manganese about the lake Vettern.

Arsenic has been reckoned among the ingredients which sometimes impregnate mineral waters, though no certain proofs have been brought of any water containing it. Varenus, in his *Geography*, mentions poisonous springs which were imagined to be impregnated with it ; and Dr. Baldassari, in his

his treatise on the Waters of Chianciano in the country of Siena, tells us, that near to that place, in the way to the Aqua Sancta, rises a little spring, in a bed of gypsum, the water of which kills any animal that drinks it, and he suspects it to contain arsenic, but, owing to a foolish fear, he did not analyze it.

S E C T. V.

Of Fossil Oils.

MOST, if not all waters, even those esteemed the most pure, contain a portion of an oily matter; but in general it is in so very small quantity as not to be perceived by our senses, and is only to be discovered by evaporating a large quantity of the water; and by finding marks of its existence in the solid contents left, after the water is all evaporated; however, some particular waters contain an oily matter, called fossil oil, in large quantity: this fossil oil, commonly called petroleum, is found, as I formerly observed, more or less pure in dif-

ferent parts of the world. The finest sort is limpid and crystalline, and has been called by authors *naphtha*, by way of preference; the sort next in purity is transparent, and of an amber colour; and the coarser sorts are black and thick, like tar.

These oils are commonly found in wells of water; the finer sorts swim on the surface of the water; the heavier black sort sinks to the bottom.

The water in which these oils have been found, have not hitherto been examined by chymists; all of them retain the flavour of the oils mixed with them, even though they have stood till all the oil has been seemingly separated from them, and they have been filtered through paper; those of them which contain a fossil salt, or any other substance which is a menstruum for such oils, have some of the oil incorporated with the water. Wallerius in his *Hydrologia* says, that such waters have a white colour, which becomes yellow by digestion, and that they have a bituminous and sulphureous smell, and many of the properties of those waters called sulphureous.

Springs

Springs which yield the finer sort of oils, are found in the island of Sumatra; in several places in the Persian empire; in the country of Modena, and in other parts of Italy, and in many other countries. Wells which afford a coarse black fossil oil, are to be met with at Pitchford in Shropshire; at Liberton, in the county of Mid-Lothian in Scotland, and in many different parts of the world. Wells in the neighbourhood of ancient Babylon, are said to have supplied such a quantity of it, that it was used by way of mortar for building the walls of that great city; and a coarse sort of these oils which the inhabitants of the island of Minorca call *Geech*, is at this day used for the same purposes.

A fine bituminous vapour rises from the bottom of some wells, and pervades the water, though no fossil oil is observed in the water itself: when a lighted candle is brought near to the surface of this water, the vapour catches fire, and continues to flame and burn for some time; from whence such wells have been called *burning wells*. There is a well of this kind at Broteley,

in Shropshire, and another at Wigan, in Lancashire; one at Cracow in Lesser Poland, others at Megien and Hermanstadt in Transylvania, and others in different places. The cause of the flame produced by the approach of a lighted candle, was first discovered by Mr. Thomas Shirley in the year 1659, who caused the water of the well at Wigan to be drained away, and found that the inflammable vapour rose from the ground at the bottom, and flamed when a lighted candle was brought near, in the same manner as it had done before, when it rose through the water; and afterwards, on applying his hand first to the place of the earth through which the vapour rose, and afterwards to the surface of the water, he perceived a strong breath, as it were a wind, to bear against his hand, as he mentions in the 26th vol. of the Philosophical Transactions.

The waters of the wells which afford any of these oils, are not used for medicinal purposes.

S E C T.

S E C T. VI.

Of Sulphur.

SULPHUR is a substance with which many mineral waters are impregnated; these are known by their strong fetid smell, resembling that of the washings of a foul gun, and by the colour they give to silver, and its solutions. Such waters are often pure and transparent as the clearest rock water, when taken up immediately from their springs; but if kept in an open vessel, or even in ill corked bottles, they soon become of a milky sort of foulness, and lose their sulphureous smell; the bottom of their wells and of their channels become of a black colour; and they deposit a raggy matter on the grass, leaves, and branches of trees, over which they run for some time; and if these be taken up and dried in the sun, they appear covered with a whitish dust, that is undoubtedly sulphur; for if they be burnt on a red-hot shovel, or on a clear live coal, they

produce a blue flame, and emit a very suffocating sulphureous smell.

Dr. Shaw, in a note to his translation of Dr. Hoffman's Treatise on Mineral Waters, says, that he separated by bare straining a true and perfect sulphur, which he found floating like feathers in the well of the sulphureous water at Harrowgate. Father de Tertre, in page 22d of second volume of his *Histoire Naturelle des Antilles*, tells us, that when he was in the island of Guadaloupe, he one day amused himself with evaporating some of a sulphureous water which he took up from a spring near the burning mountain, in a tin plate, with a gentle heat; and that when the water was evaporated, there remained on the plate a layer of sulphur, about the thickness of a leaf of paper, which burnt immediately on fire being applied to it. Dr. Pannonius, in his *Hydrographia Comitatus Trenciensis*, mentions his having obtained a pure sulphur, by evaporating some of the thermal water at Trenc, situated on the River Wag, in Hungary. In the year 1771, having evaporated with a very gentle heat, four pounds and seven ounces of the sulphureous

fulphureous water of Castle-Leod, in the county of Ross, in Scotland, which had been sent to London; I threw the solid matter which had remained after the earthy parts had been separated, into some distilled water, and then filtered this through paper, and after the paper was dry, I observed that its inside was covered with a yellowish powder, part of which I rubbed on a shilling, and it tinged it yellow, as pure sulphur would have done; and when part of this paper, with the powder, was lighted with a candle, and the flame extinguished, it smelt strong of sulphur. Dr. Brown, in his Travels, mentions his having caused some of the pipes which carry off the water from the Duke's Bath at Baden, in Austria, to be opened, and he took from their upper part a quantity of fine sulphur, in powder, somewhat like flour of brimstone, which had been sublimed from the waters. And a sulphur of the same kind is got from the upper part of the pipes and conduits, which convey the waters of Aix la Chapelle from their sources.

From these and a number of similar facts, I think that we may justly conclude, that
a ful-

a sulphur dissolved in some manner or other is contained in those waters called sulphureous.

Sulphur may be dissolved in water by means of an alkaline salt, or by quicklime assisted by heat; and perhaps waters so impregnated may hereafter be discovered; particularly near to volcanoes, or where there is subterraneous fire; but I do not know that any natural water has hitherto been proved to be impregnated with sulphur in this manner.

Dr. Vandellius, in his *Traſtatus de Thermis Agri Patavini*, published in 1761, mentions a substance found in the conduits of the waters of the Baths at Aponum, which he calls crystallized sulphur, and says, that it dissolves in the thermal waters by mere boiling, and restores to them their former sulphureous qualities after they have been lost. If this account be accurate and just, it shews that nature is capable of generating a salt of sulphur soluble in water, which was before unknown. It is a curious fact, and merits further inquiry.

Till

Till very lately, it was not known by what means sulphur was united to waters in the natural springs; nor was any method known how to separate it from them. Many were the theories formed on this subject; some supposing that the sulphur was dissolved in these waters, though the means how were unknown to them. Others, that the waters contained only a sulphureous vapour; and Dr. Lucas, that they contained both an acid and a phlogiston in a volatile state, and that when these two principles met on the upper parts of pipes or conduits, that they there formed a true and perfect sulphur, which did not exist in the water. Dr. Dejean of Leyden, being at Aix la Chapelle in the year 1777, tried a number of experiments to discover the nature of these waters; and at last, on mixing a solution of arsenic in the marine acid, with some of the water of the Emperor's Bath, a true and genuine sulphur was precipitated to the bottom of the vessel in which the water was contained; which convinced him that sulphur was dissolved, and kept suspended in it, by means of fixed air.

Sir

Sir T. Bergman, in his History of the Analysis of Waters (published A. D. 1778) observes, that a genuine hepar sulphuris is rarely present in the mineral waters, although it is fallaciously indicated by an hepatic vapour, consisting of sulphur resolved into the form of vapour, by means of phlogiston, and the matter of heat; and he says, that such waters are decomposed by the addition of the strong nitrous acid, which precipitates the sulphur by seizing the phlogiston that was united to the matter of heat, and kept the sulphur suspended in the water, in such a manner, as to elude all the common methods used for examining such waters.

S E C T. VII.

Heat.

HEAT or fire has been long looked upon as a particular and distinct body or element; and many authors have attempted to explain its nature and properties; but
though

though their researches have been productive of many curious and useful discoveries, yet they have not as yet been able satisfactorily to explain its true nature; certainly however, whatever it may be, it seems to be the cause of fluidity, vapour, expansion, inflammability, ignition, vegetation, and many other operations in nature; and to water it gives fluidity, and increases its power as a solvent of many of the substances with which it is often impregnated. To attempt to explain the nature of heat, and its properties, would be quite foreign to my present purpose, and therefore I shall do no more at present than inquire whence arises that increased degree of heat, which some particular waters acquire in the bowels of the earth, above that of the water of common springs. Many have been the solutions of this problem, but the two opinions now most generally supported are; that it is either occasioned by, 1. Subterraneous fire; or, 2. By the mixture of certain mineral bodies in the bowels of the earth.

1. The heat of waters in the neighbourhood of volcanoes, such as those of *Ætna*,
Vesuvius,

Vesuvius, Hecla, &c. is certainly owing to subterraneous fire; and the number of waters thus heated must be very great, as volcanoes and appearances of subterraneous fires, are very frequent in many places of the world.

2. But the heat of waters in countries where there are no volcanoes, or suspicion of subterraneous fire, is most probably occasioned by the mixture or solution of certain mineral bodies by water in the bowels of the earth; and from the pyrites-stone heating so frequently in mines, most late authors have embraced this opinion.

We have two remarkable facts related by authors, which, if true, prove beyond a doubt, that some waters are heated by passing through certain strata in the body of the earth.

Henricus de Roccas, in the 1st chap. of his Treatise on Mineral Waters, which is to be found in the 6th volume of the *Theatrum Chymicum*, published at Strasburg, A. D. 1671, tells, that in order to discover the cause of the heat of the water of a certain fountain, near the mountain called Plenisselus, from which the river Po takes its rise, he

caused the earth to be dug, and at the end of fifteen days the workmen came to a place, where the water was very hot, and boiled; but after digging for three days longer, they found the waters which necessarily supplied the hot spring, perfectly cold. And Dr. Short, in page 72 of his first quarto volume, mentions, in his account of the tepid Baths at Matlock, in Derbyshire, that all the warm waters spring up from between 15 and 30 yards above the level of the River Derwent; for that either higher or lower the springs are cold; so that the materials warming and impregnating these waters lie in that height. He tells likewise, that in digging to discover the nature of the minerals through which the waters passed, the workmen came to a mixture of a white and black croil stone, encompassed with, and closely adhering to the limestone, at which place the waters began to be tepid; that after this, on coming to a great store of black croil, spar, limestone, and ore, with some little cauk, and by and by to a strong thick bed of black croil set about with spar, and mixed with ore, in the bowels of limestone,

the

the water rose up with 'an impetuous force, and at its full warmth; on digging deeper, the heat of the waters decreased; and the waters were warmest where the black croil was thickest in the black or blue limestone; the Doctor carried home with him specimens of the different mineral substances which were dug up; and on infusing them separately in common water, found that none of them generated heat; but that on mixing the two infusions of croil and limestone, the spirits of a thermomèter, which were set in the vessel into which they were poured, immediately rose five degrees.

Such are the ingredients found in mineral waters, which are seldom to be met single, but generally two, three, four or more in the same water.

S E C T. VIII.

The Methods used to discover them in Waters have been,

1st. THE examining the waters by the taste and smell, at the fountain head; the
 setting

setting them by in large open vessels, to observe what spontaneous changes they undergo, whether they lose their taste, or let drop any earthy or metallic matter; and observing likewise what substances they let drop in their wells.

2d. The mixing the waters as taken up from the fountains with coloured tinctures and infusions; or with other substances which strike different colours and shades of colours, with the various matters with which they may be impregnated.

3d. The mixing such substances with them as have a greater degree of attraction with the water, or with the acid or other menstruum, than the mineral bodies naturally dissolved or suspended in them.

4th. The putting different vessels over the fountains, or over large bottles full of the water taken up immediately from the wells, to catch the volatile parts; or by distilling large quantities of the fresh waters in close well-stopt vessels.

5th. The evaporating the waters with a gentle heat in large open vessels, to obtain

the solid more fixed parts; in doing of which two methods have been practised. 1st. The evaporating to dryness; and then separating the salts and earthy or metallic parts, by mixing the whole with hot or boiling distilled water; and when the salts are dissolved by filtering the water with the salts through paper, and separating the salts from each other, by evaporating and crystallizing; and afterwards separating the different insoluble matters left in the filter from each other, by adding such menstrua as dissolve one part, but not another. 2d. The separating many of them in the time of the evaporation; for the waters commonly let drop successively, one after another, the absorbent earth and iron, which are not dissolved by a fixed acid, very soon after the application of heat, and the selenites commonly (though not always) while there yet remains a larger quantity of water than is sufficient to keep the other salts dissolved. After this, if the evaporation be continued, often the salts, which take different quantities of liquor to dissolve them, may be successively separated from each other by

by repeated crystallizations. Many of the *calcareous Glauber's* salts take from 20 to 80 times their own weight of water to dissolve them; alum $3\frac{1}{5}$; sea salt 3; Glauber's salt above 2; fossil alkali 2; Epsom salt 1; White Vitriol above 2; Green and Blue Vitriol in less than their own weight of water; and the calcareous and magnesiated marine are with the greatest difficulty to be obtained in a crystallized state, and in general must be evaporated to dryness, to obtain them in a solid form.

C H A P. II.

*OF PARTICULAR MINERAL
WATERS.*

HAVING premised these few things relative to the different matters with which mineral waters are impregnated, I shall conclude what I have to say at present on this subject, with giving a general account of some of the principal waters which are used for the preservation of health, and the cure of diseases in this island; and refer those who wish to be further informed on this head, to my Treatise on Mineral Waters, published in the year 1770, and to the works of Dr. Short, Dr. Ritty, Dr. Lucas, Mons. Vénel, Mons. Monet, Mons. le Roy, Sir Torbern Bergman, and of other authors, who treat on Mineral Waters.

In considering the few waters I mean to take notice of, I shall range them under the following

following heads; 1. The Saline; 2. The Metallic; 3. The Sulphureous; which will comprehend all those in common use in this island.

In considering mineral waters, a great difficulty arises in classing them properly; for we seldom meet with any water which is impregnated with one matter only, but generally with several, and those belonging to different classes of bodies; however, wherever any substance is prevalent in a water, I shall rank that water under the class to which that substance belongs, though at the same time the water may be impregnated with other matters, which might seem to intitle it to be put in another class.

C L A S S I.

OF SALINE WATERS.

S E C T. I.

Waters containing Fossil Alkali.

THE first of this class which I shall consider, are those impregnated with a fossil alkali; three of which have been much used in this country. 1st. and 2nd. The *Tilbury* and *Clifton* are English waters, which contain fixed air, but not in large quantity. 3d. The *Seltzer*, brought from Germany, so highly impregnated with it, as to deserve to be ranked among the acidulæ.

1. *Tilbury.*

This water is got from a spring situated near a farm-house at West Tilbury, in the county of Essex. It is not quite limpid
at

at the well, but has something of a straw coloured hue, and is covered with a variegated earthy scum; but it keeps long clear in bottles. When poured into a glass, a number of minute air bubbles form on the sides; and an explosion follows the opening of a bottle in which it has been kept, which shews it to contain a quantity of air.

It is soft and smooth to the taste, though after being agitated in the mouth, it impresses a small degree of roughness on the tongue.

Authors have differed with respect to the quantity of solid ingredients they have obtained from it by evaporation. Mr. Andre, who published an account of this water in the year 1736, mentions his having evaporated this water at two different times; and that at one time he got in the proportion of 240 grains, and at another 252 grains from the gallon, and that of these two residua, one-third part was earth, the other two-thirds an alkali. Dr. Rutty, who evaporated this water repeated times, says, that on a medium, he obtained about 180 grains of solid matter from the gallon; and that

only from a fifth to an eighth part was a calcarious earth; the rest an alkaline salt; and that some of the residuum, on being put on a red-hot iron, sparkled, and shewed that it contained a pittance of an oily matter.

This water operates mostly by urine, though it purges some people on first drinking it. A quart is reckoned a middle dose. It has been recommended in diarrhœas and old dysenteries, in disorders of the stomach from acidity, in the gravel, in the fluor albus, in immoderate fluxes of the menses, and in many other disorders. And Mr. Andre, in his preface to the account of this water, goes so far as to allege, that it is as true a specific for diarrhœas, and all kind of fluxes, as the bark for intermitting fevers.

2. *Clifton.*

This well lies a mile from Deddington, in Oxfordshire; it is a weaker water of the same sort as the Tilbury. Dr. Short says, that a gallon yielded seventy-four grains of sediment; nine of which were earth, and
 sixty-

sixty-five an alkaline salt, mixed with some white sand (probably selenites). He says, this is a fine laxative water, being pretty rich in the most alkaline salt he had seen in any water. This water deserves to be more particularly examined.

3. *Seltzer.*

This water is got from a spring near to the town of Nieder Seltzer, in the bishoprick of Triers, in Germany.

The spring is very plentiful, and the waters rise with force into a small basin, from which they are discharged by a pipe that is commonly covered with a yellow depot; they are extremely limpid, and their surface in the basin is continually ruffled by a number of air bubbles, which rise up from the bottom, and throw up the water in the same manner as we see when acid and alkaline salts are mixed together in any liquor; and the jets of the water are to be observed for a foot above the surface of the well. It has a brisk acidulous taste as taken
up

up from the fountain, but loses it on being exposed to the air in an open vessel.

No foreign mineral water being more used in Great Britain than the Seltzer, both for pleasure and for health; I shall be the more particular in the account I give of it. Dr. Hoffman, in the History of the Analysis of this Water, says, that by standing, it acquired a lixivial taste, and that he obtained 72 grains of residuum by evaporating 24 ounces of the water, which yielded 40 grains of a pure alkaline salt; and Dr. Brocklesby, in the fourth volume of the Medical Observations and Inquiries, published in 1771, mentions his having obtained a residuum of the same nature, but in less quantity.

In the year 1753, Dr. Venel presented to the Royal Academy of Sciences at Paris, a very particular account and analysis of these waters, which were published in the year 1755, in the 2d volume of the *Memoires de Mathematique & de Physique, présentées à l'Academie des Sciences par divers Scavans & lus dans ses Assemblées*. As this is the first particular history of any analysis that was published, proving that the *mineral spirit*

spirit which gives the acidulous taste and liveliness to mineral waters, was nothing but *fixed air*, I shall give it here at some length.

Dr. Venel, after describing the situation of the well, and the appearance of the water, observes, that the sparkling and liveliness of waters depend on their mineral spirit, which has been alleged to contain a fine volatile sulphureous or vitriolic acid; though he believes it to be nothing else, than a superabundant quantity of air, without the addition of any acid; and his reasons for thinking so, are,

1st. That the appearances observed in the Seltzer, as well as in other spirity mineral waters, such as their sparkling and throwing out a number of air bubbles, their appearing to boil when exposed to a gentle heat; their bursting their bottles, &c. all answer to the effects of air, but not of a volatile acid.

2nd. That he separated air from them by shaking—by a vacuum—and by exposing them to heat. By shaking them immediately on being taken up from the fountain, he obtained six cubic inches of air from each
pound

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pound of sixteen ounces of the water ; but the quantity of air which he got from the waters after they were carried to Mayence and to Paris was less ; by distilling them, at each of these two places, he got only about five cubic inches ; and by means of a vacuum, he got only three.

3rd. That they lose their superabundant quantity of air by being exposed in an open vessel, and never afterwards recover it ; and after their air is evaporated, or is extracted from them, they exhibit none of the phenomena, which entitle them to be called spirituous.

4th. That one perceives no smell when the head is held above the well ; nor when the nose is put to the mouth of a bottle which has been half filled, and immediately well shook after it is taken up from the fountain ; nor when the waters are either hot or boiling ; nor does their spirit affect or stimulate the eye, when exposed to it in like manner.

5th. That cloths wetted with a lixivium of soda, and exposed to the vapour of the waters, both when cold and when hot, for some time,

time, gave no marks of the separation of a volatile acid, when strong spirit of vitriol was dropt upon them.

6th. That when he distilled them at Mayence, the first runnings of the water had neither taste nor smell, nor did they redden syrup of violets.

7th. That the smallest quantity of volatile sulphureous acid, mixed with water, always gives marks of an acid. Three drops of this volatile acid, mixed with four ounces of distilled water, gave an acid sulphureous smell; stimulated the eye; and after standing twelve hours reddened a little the syrup of violets; and that two drams of this volatile acid, added to seven pints of water, mixed with an ounce of spirit of vitriol, and exposed to heat, always occasioned a smell of a volatile sulphureous acid.

From these facts, Dr. Venel thinks it is evident, that these waters contain no volatile acid; and that what has been called their *spirit*, is nothing but a superabundant quantity of *fixed air*.

The specific gravity of Seltzer water taken up immediately from the fountain, is to that
of

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of the water which has stood till it has become effete, as 4,608 to 4,622.

As these waters have been said to contain an alkaline salt, Dr. Venel tried the following experiments, to know whether it was so or not.

1st. He poured a scruple of the vitriolic acid into a pound of Seltzer water, and a like quantity into a pound of common water ; and the Seltzer water reddened the syrup of violets as much as the other.

2nd. He repeated the experiment with a vitriolic acid, whose specific gravity was to that of common water, as fourteen to eight ; and as soon as he had dropt four grain weight of it into half a pound of the Seltzer waters, they began to redden the syrup of violets, which shewed that there was no free or disengaged alkali ; at least in such a quantity as to act upon the water ; for it took as much acid to make a like quantity of common water, and of snow-water, have the same effect in reddening the syrup of violets.

3rd. He concentrated the half pound of the Seltzer water, with the four grain weight
of

of acid to an ounce, and it still reddened the syrup. He then evaporated almost to dryness, and it still continued to have the same effect, which could not have been the case, had each medical pound of the Seltzer water contained a scruple of the alkali, as Hoffman has alleged; or even a much less quantity of it.

From these experiments, he says, it is evident that these waters do not contain any free disengaged fixed alkali, or even alkaline earth, more than common water.

A solution of fixed alkali dropt into a pint of these waters, occasioned a little turbidness, and made them drop a very small quantity of white earth, but so small, that it could scarce be gathered; after which they became clear, and dropt no more earth, when more of the alkaline solution was dropt into them.

In order to know the real contents of these waters, Dr. Venel evaporated to dryness, twenty pounds (of sixteen ounces each) of them, in a very large glass vessel, by means of a water bath; and had remaining six hundred

dred grains of solid matter, which was in the proportion of 30 grains from the pound.

This residuum, Dr. Venel carried with him to Paris, where he mixed the whole with boiling snow-water to dissolve the salts, and then threw it into a filter, which the whole passed, except a small quantity of white earth. After this, he evaporated the liquor with such a gentle heat, that there may be said to have been a number of successive crystallizations; the four first of which yielded pure sea-salt, and the fifth crystals, which had the characters of it, but tasted slightly sharp and bitter, and somewhat lixivial; the liquor which remained was of a diluted citron colour, and still afforded a few cubic crystals, which had a little of a lixivial taste, even after being washed; and at last there formed some small crystals, resembling those of Glauber's salt; but which had a marine acid for their basis, which was dislodged by pouring some of the vitriolic acid on them. He says, that these crystals did not lose their transparency by being exposed to the air, though after some time they grew moist, and seemed to be of the same

same kind as what is obtained from the bitterness of the salt waters in Lorraine, Normandy, and other places. The very small quantity of liquor which remained after these last crystals were separated, was a true bitterness of sea water, which will not crystallize.

From this analysis, Dr. Venel thinks that it is evident, that the Seltzer waters are impregnated with nothing but sea salt, and a large quantity of fixed air. And he thinks, that the air in these and in other spirituous mineral waters is truly united, dissolved, and combined with the water in the true sense of chymists; that is, divided into its minutest parts, which do not combine while they remain in that state, but that this union with the water, though real, is very slight.

The Doctor observes likewise, that the effervescence which ensues on the addition of acids to the Seltzer waters, is entirely owing to the acid dislodging the air, by having a greater affinity with the water than it. And he says, that he added spirit of vitriol to the Seltzer waters, and likewise to their residuum, and that he obtained a true Glauber salt on

evaporating and crystallizing ; and that the earth which the sea salt of the Seltzer waters drop, by repeated evaporations and digestions, is what has given them the name of alkaline ; but that this is no more than what happens to all salt waters, when subjected to the same operations.

Dr. Venel, after giving a very particular account of the above, and of many other experiments which he made with the Seltzer waters, concludes his paper, with proposing to impregnate water with aerial acid, by saturating mild alkaline salts with acids in the water itself, either in large vessels quite shut, or in vessels which have but a small communication with the external atmosphere, and by letting the vessels remain at rest, without shaking ; for motion, he says, prevents the union, and disjoins the air from the water that is already united ; and he mentions, that he in this way imitated the natural Seltzer waters, by saturating with the marine acid, in two pounds of common pure water, that quantity of the mild fossil alkali which it required, to make a quantity of sea-salt
equal

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equal to that which two pounds of the natural Seltzer water contained.

In the year 1778, Sir Torbern Bergman published his Analysis of Mineral Waters, in which he gives an account of this; and says, that a kanne full of it (the kanne containing a hundred Swedish cubic inches) yielded,

1. About a cubic inch of *common air*.
2. Sixty cubic inches of *aerial acid*, or *fixed air*; and,

	Grains.		Grains.
Of aerated Lime	17	Of crystallized Mi-	
		neral Alkali —	24
Of aerated Magnesia	29 $\frac{1}{2}$	Of common Salt	109 $\frac{1}{2}$

The Seltzer waters operate chiefly by urine, seldom or never by stool. From the great quantity of fixed air they contain, they prove powerful antiseptics, and give a gentle stimulus to the nerves; they allay heat and thirst, and have been much prescribed in scorbutical, phthifical, and nervous cases. Dr. Hoffman recommends them much for correcting the bad habit of the blood and other juices, in arthritical and gouty cases, and as powerful deobstruents.

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They are drank from a pint (lib. 1. to three or more pints in the day; and are often mixed with milk in phthifical and other hectic cases, and agree well.

S E C T. II.

Of Waters containing a vitriolated Magnesia or vitriolated absorbent Earth, commonly called calcarious Nitre, or calcarious Glauber Salt.

HITHERTO no waters have been discovered in Great Britain, which contain such a quantity of true Glauber salt, or vitriolated fossil alkali, as to be used on that account; though there are a great many which contain a purging vitriolic salt, with an earthy basis, which has been frequently mistaken for it. It is this sort of vitriolated earthy salt which commonly is the cause of what is called hardness in waters; and Dr. Ratty, as we formerly mentioned, says, that waters begin to deserve the name of hard, when they contain ten grains in the pint (or eighty in the gallon) of this sort of salt, and that they then begin to prove laxative. All these waters become turbid and milky on dropping

an alkaline solution into them, owing to the alkali having a greater affinity with the acid of the natural salt, than the earthy basis with which it was combined; and they often contain more or less sea salt, and other ingredients, besides the vitriolated earthy purging salt.

These waters, taken in small quantity, act as diuretics, and in large quantity, they prove purgative. Some of them are strong, and a pint proves a brisk purge to most people; others are weaker, and require two, three, four, or more pints, to produce the same effects. And the weaker kinds of all are sometimes used as alterative diuretics and deobstruents; and a dram or two of purging salts are added occasionally to them, when it is intended that they should operate by stool.

Such waters are drank to free the blood of acrimonious humours, in scrophulous and scorbutic habits, to carry off leprous or other cutaneous disorders, to remove chronic obstructions; and as they operate freely and mildly by stool, they have been found to be of the greatest service in the cure of diarrhœas

and dysenteries, which depend on foulness of the bowels; and they have been given in variety of other disorders. They have likewise been used as baths and fomentations in many cutaneous and other disorders.

As the virtues of the waters of this kind do not depend on volatile, but on fixed principles, I shall do little more than mention the solid contents of such as I shall take notice of, and the quantity of each of them which is commonly drank. There are a great many waters of this kind in England, and other countries; but here I shall only take notice of a few in the neighbourhood of London, where they are very frequent, owing probably to the soil abounding with magnesia and absorbent earth, which is acted upon by the vitriolic acid which is let loose from the great quantity of sea coal that is daily consumed.

Those I shall take notice of are the following:

- | | |
|----------------------|-------------------|
| 1. The Acton. | 6. The Epsom. |
| 2. The Bagnigge. | 7. The Kilburn. |
| 3. The Cobham. | 8. The Pancras. |
| 4. The Dog and Duck. | 9. The Stretham. |
| 5. The Dulwich. | 10. The Sydenham. |

Of

Of these, the *Bagnigge*, the *Pancras*, the *Kilburn*, and the *Acton* waters lie on the north side of London, in the county of Middlesex. The *Dog and Duck*, the *Dulwich*, the *Stretham*, and the *Sydenham* waters, lie on the south side, in the county of Surrey; and the *Epsom* at 17 miles distance, and the *Cobham* at 24, both in the county of Surrey likewise.

1. *The Acton.*

The *Acton* wells lie about four miles from the Tyburn turnpike, on the Uxbridge road; this water is clear, without any smell, and has a little of a bitterish taste. Dr. Ratty got 340 grains, or five drams two scruples of sediment by evaporation from a gallon; of this five drams and 21 grains were vitriolated magnesia or vitriolated absorbent earth (called formerly nitrum calcarium), which took forty-eight times its own weight of water to dissolve it; and 19 grains of earth, which did not calcine to lime, but dissolved in the vitriolic acid.

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This is reckoned amongst the strongest purging waters in the neighbourhood of London. It is drank from one to three pints in a morning.

2. *Bagnigge.*

The wells are situated at the bottom of the hill, on the south-west side of Islington, on the road to Red-Lion Street; the water is clear, and tastes brackish, like a weak solution of Epsom salt. Dr. Bevis evaporated it, and got 392 grains, or six drams and 32 grains of solid matter from the gallon; of this, he says, 135 grains were an insoluble earth, 257 a bitter purging salt, mixed with a marine salt, which give the waters their purging quality. From these salts running easily per deliquium, and from the difficulty Dr. Bevis found in crystallizing them, I think that it is probable that the salt of this water is mostly an Epsom, mixed with a good deal of a bittern.

Dr. Bevis says, that this water throws up a great many air bubbles, and that it purges in less quantity than perhaps any other water

ter in England; three half pints being a full dose in most constitutions.

3. *Cobham.*

The spring of this water, Dr. Hales says, lies a mile south of Church Cobham, in Surrey, about 24 miles from London, near the Guildford road. Dr. Hales mentions his having obtained from a gallon of this purging water at one time an ounce, and at another time nine drams, by evaporation. Dr. Rutty mentions a chalybeate water, which is near to it.

4. *Dog and Duck.*

This spring is situated in St. George's Fields, in Surrey, about half a mile from Westminster Bridge.

The quantity of solid contents got from this water seems to be different at different times. For,

Dr. Hales says, that he got		
in the proportion of	—	324 grains from the gallon.
Dr. Fothergill,	— —	200 grains
Dr. Rutty, only	—	96 grains

Of this about one-twelfth part is an earth, which Dr. Rutty says is soluble in acids, but

but does not calcine to lime; the salt vitriolated magnesia, (nitrum calcarium) and sea salt mixed together.

Drank from one to three pints, it generally purges briskly, and with ease, and without affecting the strength; though after patients have been accustomed to it for some time, it is frequently necessary to add a dram or two of Epsom, or of Glauber salt to the first glasses, in order to quicken its operation as a purgative remedy.

Formerly this water was much used in scorbutic and scrophulous disorders; and this, and other waters of this kind, were much prescribed for easing the pain of cancerous sores, and for preventing relapses after cancerous tumours had been extirpated.

5. Dulwich.

The well is situated in the village of Dulwich, in the county of Surrey, about four miles south-east of London Bridge.

This water is clear, obscurely brackish, and tastes a little bitter in the throat.

Dr. Ratty evaporated it, and at one trial got two, and at another three drams of solid matter

matter from the gallon, containing a small portion of calcarious earth, and a vitriolated magnesia, mixed with a portion of marine salt.

It is drank, from one to three pints in a morning.

6. *Epsom.*

The well of this water is situated near to the town of Epsom in Surrey, which lies about sixteen or seventeen miles south-west of Westminster Bridge. The water has been long in great repute, and was the first water from which a bitter purging salt was prepared, and for this reason is one of the most noted purging waters in Europe.

Authors differ about the quantity of solid contents which this water yields.

Dr. Lister says, that a gallon		
yielded him	—	An ounce and a half,
Dr. Rutt	—	One ounce,
and in some seasons only half this quantity.		
Dr. Lucas	—	Only five drams and a scruple.

Of this solid matter, Dr. Allen alleged, that one-eighth part was an earth or insoluble

ble matter; but Dr. Rutty says, that he found a much less proportion of it, and that it was of a calcarious nature.

The salt is mostly a vitriolated magnesia, or vitriolated absorbent earth; and Dr. Rutty says, that it requires at least 24 times its own weight of water to intirely dissolve it; though the factitious Epsom salt dissolves readily in little more than an equal weight of water. Dr. Lucas, who likewise analyzed this water, tells us, that if the natural salt of this well be dissolved in distilled water, and evaporated, that it shoots into crystals, resembling those of Glauber salt, and that there remains a bittern, which will not crystallize.

7. *Kilburn.*

A water of the same kind, situated on the Edgware road, three miles north from Tyburn turnpike. Dr. Hales says, that he obtained by evaporation 344 grains of solid matter from a gallon of this water.

8. *Pancras.*

8. *Pancras.*

Another water of the same kind, the spring of which rises near to Pancras church, which is situated about a quarter or half a mile north of the New Road, which runs from Islington to Paddington, and about half a mile west from Islington. This water is clear at the fountain, and has but a slight brackish taste. Dr. Ruty evaporated it, and obtained 300 grains of solid matter, which was mostly, he says, a calcarious nitre, that is, a vitriolated magnesia, mixed with a small quantity of earth, which did not calcine to lime.

Like other waters of the same class, it is diuretic and purgative.

9. *Stretham.*

This spring rises five miles south of London Bridge, in the county of *Surrey*. A gallon yielded Dr. Ruty 200 grains of residuum, forty of which were a calcarious earth, the rest a salt compounded of vitriolated magnesia, sea salt, and a bittern. It is a
weak

weak purging water, which is drank from one to two or more pints in a morning.

10. *Sydenham.*

This well is situated about eight miles south from London Bridge, in the county of Kent, and about four miles beyond Dulwich. Dr. Rutty says, that it is a weak purging water, about half the strength of the Epfom, and that a gallon yielded him 240 grains (or half an ounce) of solid matter; of which 29 grains were a calcarious earth; the rest a salt, which took 24 times its own weight of water to dissolve it, the greater part of which was calcarious nitre (vitriolated magnesia) and a small quantity of sea salt.

S E C T. III.

Of Waters impregnated with Sea Salt.

SEA salt is most universally diffused over the face of the earth; it not only impregnates that great body of water, the sea, but is found more or less in most waters,
called

called mineral. However, under this head, I at present propose only to take notice of sea water, and of two or three salt springs which are used medicinally.

Most salt waters contain, besides sea salt, a salited magnesia, and a salited calcarious earth, and many likewise a vitriolated magnesia or vitriolated absorbent earth, and some a selenites.

Sea Water.

The water of the sea is impregnated with different quantities of salt in different climates; the nearer the equator, the more it is charged with sea salt. In some places in the Torrid Zone, the sea water is alleged to have yielded one-sixteenth, or one seventeenth part of salt; in the British seas, it yields from one-twenty-fourth to one-thirty-first or thirty-second part,

Sea water evaporated with a very slow fire, first throws up an earthy pellicle, which, after some time, precipitates to the bottom; this has been called the *scum*, from its rising to the surface; and the *stony scratch*, from its precipitating and forming a strong crust

in the bottom of vessels, much used for preparing salt; this pellicle is formed of an earth of the calcarious kind; and, Dr. Speed says, is in the proportion of about 57 grains in the gallon; Dr. Lucas, from 64 to 80 grains.

When the water is evaporated, till it contain more than one-fourth part of sea salt, the salt begins to form into cubic crystals; and after all this salt, which in the sea water round this island amounts to above four ounces in the gallon of water, has concreted, and is separated, there remains a yellowish ley of the consistence of a syrup, which is called the bittern, and contains a neutral salt with an earthy basis. In the Philosophical Transactions, No. 377, we are told, that this bittern or ley is conveyed into pits, and there let stand exposed to the air for some months, when the *sal catharticum amarum* concretes into crystals, and when these are separated, the ley is further evaporated, till a disposition to crystalize is again observed, and more of the salt concretes; and in this manner the ley is alternately further evaporated, and the salt allowed to crystallize, till all is got
that

that is proper for use ; generally, after the third boiling, the liquor acquires a very pungent taste, seems altered in its properties, and will not yield any more of the crystals of the *sal catharticum amarum*, but a salt, which, when exposed to the air, runs per deliquium.

Dr. Speed says, if the bitter salt, which remains after the separation of the sea salt, be evaporated till a pellicle appears on the surface, and it be then set by in a cool dry place, that the salt, in the ley, shoots into prismatic crystals, which on being purified by being dissolved in distilled water, and again crystallized, become the *sal catharticum amarum* of the shops.

Dr. Lucas, who evaporated sea water taken up off Harwich, obtained in the proportion of four ounces, seven drams, two scruples, and twelve grains of solid matter from a gallon, in which there was,

	ounces.	drs.	scrup.	grs.
Of sea salt, about	4	1	1	16
Of calcareous earth, about	0	1	0	0
and from 4 to 20 grains.				
Of bitter salt, from		4 to 5	& 1	
and a very small portion of an oily matter.				

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From these accounts it should appear, that sea water contains in itself the sal catharticum amarum, which is vitriolated magnesia; but Dr. Hoffman, Mons. Monet, and others, have alleged, that vitriolic acid, or substances containing it, are added to the ley after the sea salt is separated, in order to supply it with a vitriolic acid, for the formation of the cathartic salt; but I cannot ascertain at present whether this is so or not, as the method of preparing this salt in large quantity is kept a secret. If what Sir Torbern Bergman alleges in his Analysis of Sea Water is true, it still renders this fact doubtful, for he says, that he could find no traces of *vitriolated magnesia* in sea water, taken up at the depth of sixty fathoms; and that a Swedish kanne full of it (100 Swedish cubic inches) yielded,

			ounces.	drs.	scrup.	grs.
Of sea salt	-	-	2	7	0	13
Of salited magnesia	-	-	0	6	1	0
Of gypsum	-	-	0	0	2	5
			3	5	0	18

Sea water was in great repute among the antients, and has been much used by the moderns. When

When drank from half a pint to a pint or more in the morning, it proves purgative to most people, and often at the same time it increases or raises thirst; and its continued use frequently occasions an itching about the fundament, which goes off as soon as the use of it is laid aside.

It gives a brisk stimulus to the stomach and intestines, and thereby increases the appetite, and promotes digestion, by which means its use frequently may be continued for a considerable time, without weakening the patient, or hurting the constitution; and it has been found to be extremely serviceable in purging off gross humours, which have been the consequence of indulging the appetite, and leading a too lazy and indolent life; and in cleansing the intestines of viscid mucus and of worms.

The late Dr. Ruffel, of Lewis, in his Treatise on the Use of Sea Water, says, that he has found few glandular swellings, which were not already tending to suppuration, that he had not been able to remove by the use of sea water: this however is perhaps too general and too strong an assertion, for

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I have met with many on which the salt water had no effect ; though I have frequently found it to be a remedy more serviceable in removing recent scrophulous swellings in the neck and lips, and scrophulous ophthalmias, than most others in use, especially if accompanied with sea-bathing.

Dr. Ratty observes, that nothing more effectually prevents or cures the rot in sheep, than feeding them in the salt marshes, which purges them ; and that lean horses, fed on pastures washed by the spray of the sea, are first strongly purged, and then grow fat and recover.

As sea water is a heating, stimulating remedy, it is not proper where there is much heat and fever ; and therefore where patients have such symptoms, and at the same time other complaints which require the use of sea water, the body ought to be cooled by bleeding, purging, and the use of nitrous and other cooling remedies, and low diet, before the course of sea water is begun.

It has not only been employed with success as an internal remedy, but likewise externally.

ternally. It is long since cold bathing was used with success for strengthening the habit, and for restoring health. About forty years ago bathing in the sea was recommended in room of the common cold baths then in use; and since that period sea bathing has come into general use, both for the preservation of health, and for the cure of diseases. The water of the sea is heavier, contains salts which give a stimulus to the whole frame, and it is not so cold as the waters in the cold baths in common use, and on these accounts has been esteemed preferable to them; and is therefore much used for bracing the fibres, and for strengthening the habits of those who have been weakened by fevers and other diseases. It has likewise been employed for removing rheumatic pains, where there is no heat or fever to contra-indicate its use; for bracing the habits of cachectic and scrophulous patients, and for removing œdematous and other swellings; and it has been found useful in the cure of many cutaneous eruptions. And sea water has not only been used as a bath to the whole body, but has likewise

been employed as a wash and fomentation to diseased parts.

Waters strongly impregnated with Sea-Salt.

There are in England a number of salt springs, the waters of which are so strongly impregnated with sea salt, that they are never used for any other purpose than the preparation of salt. Of this kind are,

1. The salt waters at Barton in Lancashire,
2. And others near to Northwich,
which are fully saturated with sea salt,
3. The springs at Droitwich,
4. — at Upwich,
5. — at Middlewich,
which contain one fourth of sea salt.
6. Springs at Namptwich,
7. — at Northwich,
which yield about one sixth part of sea salt.
8. Springs at Weston in Staffordshire, which yield one ninth part of sea salt; besides many others.

Some few weaker ones have been used medicinally, as purging waters; such as,

9. Bar-

9. *Barrowdale.*

This spring rises at Barrowdale, which is situated three miles from Kewick in Cumberland; a gallon of its water yielded eight ounces of solid matter to Dr. Short, of which he says six drams are a light calcarious earth; the remaining seven ounces two drams sea salt, which, from the experiments since made by Dr. Rutton, should seem to contain a bittern.

This water is used by the country people, and proves a rough, severe purge and emetic, even to people of strong constitutions; and Dr. Short says, that in dropical and cacochymic disorders, in jaundice, and in foulness of the stomach and bowels, it is sometimes of service.

10. *Leamington.*

This water rises up very clear about a stone throw from the river Leam in Warwickshire. A gallon of this water yielded to Dr. Short two ounces of solid matter, of which he says thirty grains (or half a dram) were calcarious earth; the rest sea salt,

H 4

which,

which, by Dr. Rutty's experiments, should seem to contain a small portion of a vitriolated magnesia.

This water purges and vomits strongly, being drunk by rustics from two to three quarts in a morning; and Dr. Short says, it is noted for curing sore legs, breakings out, and mangey dogs.

11. *New Cartmall, or Roughman.*

This is a weaker water of the same sort; its spring rises up in the village of Roughman, two or three miles from Cartmall in Lancashire, at the bottom of a mountain. Dr. Short says, that he obtained seven drams and one scruple of solid matter from a gallon; of these contents sixty-six grains were calcarious earth, five drams sea salt, and one dram what he calls calcarious nitre, which must either have been a bittern or vitriolated magnesia. Dr. Rutty says, that he only obtained five drams of solid matter from a gallon.

The country people drink from two to six or eight quarts of this water in a morning, and it operates powerfully by stool and by urine.

12. *Pitkeathly.*

This water is situated near the village of Pitkeathly, six computed miles south of the town of Perth, in Scotland.

There are but few springs of salt water hitherto discovered in the country of Scotland. The Pitkeathly is the one in most esteem, and most frequented of any in that country.

As no particular account of these waters had been published, I in the year 1771 wrote to his Grace, the late John duke of Athol, whose seat of Dunkeld was about fourteen miles from the wells, and begged the favour of him to ask some physical person in the neighbourhood to send me an account of them; and his Grace was so obliging as not only to send me a letter from Dr. Wood, giving a description of them, but likewise six bottles of the waters, which I analysed; and afterwards I gave an account of the analysis I had made of the water, along with Dr. Wood's letter, to the Royal Society, which were both published in their Transactions (vol. 62) for the year 1772.

By this analysis it appeared, that six pounds, six ounces, three drams, and one scruple

scruple of this water yielded 225 grains of solid matter (which is in the proportion of 290 grains, or four drams fifty grains) from the gallon ;—that of this 225 grains, or four drams, 45 grains,

1. Some grains were an absorbent or calcarious earth.

2. Two drams and about 27 grains were sea salt.

3. One dram and about thirteen grains were a deliquescent marine salt, with a calcarious earthy basis :

4. And that the whole was mixed with a very small pittance of an oily matter, common to all waters.

Dr. Wood, who evaporated a Scotch pint of these waters (or half of an English gallon) in a white stone basin, obtained two drams of a salt, which always run per deliquium ; and that by dropping a solution of pot-ashes into three Scotch pints (lib. xii) of the waters, he got eighty-five grains of a fine magnesia.

Dr. Wood, in his letter, says, “ The
 “ spring rises in a very low marshy ground,
 “ undistinguishable from any other ; but
 “ by the taste of its water ; it is generally
 “ believed

“ believed to contain no other mineral principle, but a small portion of marine salt.
“ It acquires somewhat of a putrid taste by keeping, but retains its purging quality ;
“ and it keeps much better in open than in corked bottles.”

It purges gently, and without griping ; an adult person drinks commonly a bottle and a half or two bottles in a morning.— In scrophulous and scorbutic habits, it is certainly a most useful water.

A new spring has been lately discovered, about two or three hundred yards from the old one, but its waters seem to be much of the same strength and quality as the former.

C L A S S II.

Of Waters impregnated with metallic Salts.

TWO metallic substances, *copper* and *iron*, are principally to be met with in waters.— *Zinc*, in the form of white vitriol, and *manganese*, are alleged to have been found in one or two waters ; and it has been thought possible

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fible to meet with *arsenic* in others, though no such water has been hitherto discovered; and no other metallic substance is at present suspected to impregnate mineral waters.

As no waters containing copper are used medicinally in London, and none containing zinc or manganese are to be met with in this part of the world, I shall at present only consider a few of those impregnated with iron.

S E C T. I.

Of Waters impregnated with Iron.

IRON is dissolved in mineral waters, either by means of the *vitriolic*, or of the *aerial* acid, called fixed air; and sometimes partly by one, and partly by the other.

Waters containing iron are known,—by their taste—by their depositing an ochre in their wells or channels; by their striking a reddish, a purple, or a black colour, by being mixed with an infusion of galls—and by tinging the stools of the drinkers of a black colour.

Those

Those impregnated with the vitriolic acid are called *vitriolic waters*; they strike a deep purple, or a darkish blue or black colour with the infusion of galls; they coagulate milk, have somewhat of an aluminous taste; and, unless part of their iron be suspended by means of the aerial fluid, they do not sparkle and throw up a quantity of air-bubbles, as the brisk acidulous waters commonly do,—and the stronger ones yield a martial vitriol by evaporation.

Those impregnated with iron by means of the aerial acid or fixed air, when taken up from the fountains, have a brisk acidulous taste, sparkle, and throw up air-bubbles; and some of them are 'so replete with this aerial acid, that they resemble brisk Champagne wine, or bottled beer, when poured into a glass; they strike from a pale red to a darkish purple, with an infusion of galls; and they become effete, lose their brisk acidulous taste and chalybeate properties, by standing long in the open air.

Where the iron is in small quantity in a water, and part of it is kept suspended by the aerial acid, and part by the vitriolic, it is often not
easy

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easy to determine whether the water should be ranked among the vitriolic or chalybeate; and therefore some waters, which strictly speaking should be called vitriolics, are sometimes ranked among the common chalybeates.

Some waters contain very little of any other principle except iron, but in general they contain materials of different sorts besides it; and indeed there is scarce any substance found in mineral waters, that is not found combined with iron in some water or other.

There are no waters so common as those impregnated with iron; but as it is not my intention at present to treat very particularly of mineral waters, I shall only take notice of a few.

1. Of those impregnated with iron by means — of the vitriolic acid.
2. — of the aerial acid.
3. — and containing purging salts.
4. — and containing alum.

S E C T.

S E C T. II.

1. *Of Waters impregnated with Iron by the vitriolic Acid.*

WATERS impregnated with iron by means of the vitriolic acid, yield a vitriolum Martis by evaporation; and there are several waters of this kind which have been discovered in and near to coal-pits; and others in different parts of this island: many of them are too strong to be employed as internal remedies, except in very small doses and in particular cases, a few ounces proving strongly emetic and purgative; but most of them are used by the vulgar for washing and healing old sores.

Those I shall take notice of are—1. The *Shadwell*—2. The *Hartfell*. 3. And the *Hampstead*.

1. *Shadwell.*

The well of this water is situated in Sun-Tavern Fields, St. Paul's, Shadwell, about two miles below the Tower of London.

This

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This is one of the strongest waters of this class which has been discovered in England: it has an acid, austere, vitriolic taste, and gives a blueish black colour with galls.

Dr. Ratty, who evaporated this water, got 1320 grains (or two ounces, six drams) of solid matter from a gallon; of which

1132 grains were sal. Martis;

188 grains an ochreous - coloured earth, the nature of which he does not ascertain.

This water has been taken the length of a pint at two doses, early in the morning; and it vomits gently, and occasions a few stools. It has been used in scorbutic and in leprous cases with success, in old gleets, in the fluor albus, and in old dysenteric cases. The people in the neighbourhood have long used it as a wash to old sores and ulcers, and to cutaneous eruptions.

This water, when pure, is often too strong for tender and delicate habits, and it acts even sometimes roughly with strong people; but it may be diluted with spring water to any strength required, and may be used in most cases where a vitriolic water is indicated.

2. *Hart-*

2. *Hartfell.*

This is a weaker water of the same sort, which issues from the Hartfell mountain in the county of Annandale, in Scotland, three miles north of the village of Moffat. Dr. Horsburgh, who analyzed it, says that it is quite pure and pellucid, has an irony and so strong a styptic taste, that it is suspected to contain alum. By being exposed to the open air it becomes weaker : it is observed to be stronger in wet than in dry weather.

Evaporated, it left of solid matter in the proportion of 42 grains from the gallon; of which

36 grains were sal Martis ;

6 grains earth.

Dr. Horsburgh suspects that the salt contains rather more acid than the common sal Martis.

As this water drops an ochreous sediment by being exposed to the open air, and becomes weaker, it is probable that part of the impregnated matter is dissolved and kept

suspended by aerial acid, though the great part is kept dissolved by means of the acid of vitriol.

This water is recommended in most cases where preparations of iron are commonly ordered—in immoderate discharges of the menses, in the fluor albus, in gleet, in old dysenteries, in diseases from relaxation, and in many other complaints.

3. *Hampstead.*

The spring of this water rises from near the top of Hampstead Hill, a little above the Long Room, about four miles from London. This water is clear and transparent, as it comes from the spring; and has commonly been ranked among the chalybeates, though from some circumstances it should seem more properly to belong to the vitriolic class; for it keeps its ferruginous qualities after being exposed for some time to the air, and, by Dr. Soam's account, even when it has been heated till it was just ready to boil: and he says, that he evaporated a gallon of this water, and had remaining only five or six grains of solid matter, which
had

had the appearance of a yellowish earth, and tasted like vitriol of iron.

It tastes like a strong chalybeate at the spring, and is not unpleasant. Fifteen drops of a strong infusion of galls, dropt into a glass full of it, struck first a crimson, and then a fine transparent darkish purple.

This water sits easy on the stomach, and its operation is mostly by urine.—It was formerly in great repute, and was drank from half a pint to a pint or more in repeated draughts in a morning. It is certainly a most excellent mineral water, and deserves more to be attended to than it is at present.

S E C T. III.

Of CHALYBEATES,

Or Waters impregnated with Iron by means of aerial Acid.

THE chalybeates are more frequent in this country than any other sort of mineral waters, there being scarce a parish in either England or Scotland that has not one or

more of them in it ; however, I shall only take notice of a few that are in most repute, and of some of those which are situated near to places where there are other mineral waters, which company resort to.

As the *aerial acid*, which keeps the iron suspended in these waters, and gives them their brisk acidulous taste, is in a volatile state, these waters soon let drop their iron, and lose their chalybeate properties and brisk taste when exposed to the open air, owing to the evaporation of the aerial acid ; and this happens sooner or later, according as this acid is less or more intimately united with the water and the other impregnating materials ; and hence we find that some waters, such as the Islington, lose their chalybeate properties in a few minutes after being taken up from their wells ; and that others, such as the Pyrmont and Spa, retain them in some degree for hours after standing in the open air.

Chalybeates throw up air-bubbles in proportion to the quantity of aerial acid with which they are impregnated : the common chalybeates contain but a small quantity ;
they

they sparkle but little, and throw up but few air-bubbles when taken up into a glass from their fountains ; while some few contain such a large quantity, that they appear to boil in their wells, and, when taken up, sparkle and throw up air-bubbles as plentifully as brisk Champagne wine, or ripe bottled beer, when poured into a glass ; hence I shall divide the few chalybeate waters, which I am to take notice of, into *common* and *spirity*.

Common Chalybeates.

The common chalybeates, which I shall consider at present, are, 1. The Buxton ; 2. The Harrogate ; 3. The Islington ; 4. The Lincomb ; 5. The Tunbridge ; 6. The Dunse ; 7. The Peterhead.

1. *Buxton,*

In Derbyshire. Besides the tepid mineral waters which are in so much repute, there is here a spring of a fine clear chalybeate water, which has a rough irony taste. Dr. Short evaporated a gallon of it, and had remaining a scruple of solid matter, above

I 3 half

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half of which he says was ochre, and the rest a saline matter composed of sea salt and nitrum calcarium (vitriolated magnesia).

The water of this spring is drank for the same purposes as other chalybeates.

2. *Harrogate,*

In Yorkshire. At this place are the famous salt sulphureous waters which are resorted to by people from all parts of this island; and near to them Dr. Short says there are three chalybeate springs.

1. *The Sweet Spa.* About a quarter of a mile south of the sulphur well is a spring of chalybeate water, which is called the *Sweet Spa*: this water strikes a light purple with galls; a gallon of it yielded by evaporation a scruple of solid matter at one time, and only eight grains at another; of these sediments above one half is earth, the rest a calcarious nitre (vitriolated magnesia).

2. *Tuerwhet.* About a quarter of a mile south of the Sweet Spa is another chalybeate spring, called the *Tuerwhet Well*: a gallon of its water yielded at one time 13 grains, at another 19 of residuum, of which
three

three fifth parts were calcarious earth mixed with ochre, the other two fifth parts vitriolated magnesia.

3. *Alum Well.* This spring is situated in the Bogg, and has been called the Alum Well, from its water having a rougher taste than that of the other wells, and from thence being formerly believed to contain alum. A gallon of this water, being evaporated, yielded eight grains of a dark-coloured brown sediment, which had a rough vitriolic taste, and curdled milk.

From this account it is probable that, on further examination, this may be found to be a weak vitriolic water.

3. *Islington.*

The spring of this water is situated on the north side of London, and on the south-west side of the village of Islington, which now in a manner joins the city.

This is a pleasant, clear, light, chalybeate water, which has been long in repute. This water does not sparkle much, or throw up many air-bubbles, when taken up from its spring, and it very soon loses its chalybeate

qualities when exposed to the air, and it does not bear carriage. Both the fixed and the volatile alkalies make it lose a little of its transparency, but do not occasion any cloud.

This water is used for the same purposes as other light chalybeates, and is still much resorted to by invalids in summer and in autumn.

4. *Lincomb,*

Somersetshire. The spring of this water rises about half a mile south of the town of Bath, on the opposite side of the river, near the bridge.

This is a pleasant chalybeate, which loses its ferruginous property in eight hours when exposed to the air, and in a few days when kept in well-corked bottles.

Dr. Hillary evaporated this water, and a gallon at one time yielded twenty, and at another sixteen grains of a pale cinnamon-coloured sediment, which had a brackish taste; and was composed of an ochreous earth, mixed with a few grains of the fossil alkali and vitriolated magnesia.

5. *Tun-*

5. *Tunbridge,*

In Kent, 36 miles south-east from London. It is one of the chalybeates in most repute in England, and has been so for many years, though it is not preferable to many of the same sort in this island; but the accommodations for company are much better here than at most other places.

The water is a light, pleasant chalybeate, which soon loses its ferruginous qualities by being exposed to the open air, and does not retain them long if put into bottles.

Dr. Rutty evaporated this water, and at one trial got nine grains of solid matter from a gallon, at another only six. Dr. Lucas, who evaporated these waters at Tunbridge, says he got thirty grains, of which twelve were partly selenites, partly calcarious earth, twelve were sea salt, and six were ochre.

It is common for those who drink the waters at Tunbridge to mix occasionally a tea spoonful or more of common salt, or of Epsom or other purging salt, with the first
glass

glass of the water, in order to make it operate by stool.

6. *Dunse,*

In the county of Berwick in Scotland. From the account published by Dr. Home, this should seem to be a water nearly of the same strength as the Tunbridge; exposed to the open air, it loses its chalybeate qualities in two hours; and evaporated, a gallon left twelve grains of solid matter, of which two grains were sea salt and bittern, the rest ochre and a marly earth.

7. *Peterhead,*

In the county of Aberdeen, in Scotland. This is one of the most famed chalybeate waters in that country, and is much resorted to; but no analysis of it has hitherto been published.

S E C T. IV.

Of spirity Chalybeates.

THESE waters contain such a quantity of aerial acid, that when taken up fresh from their

their springs, they sparkle and throw up air-bubbles, in the same manner as brisk Champagne wine poured into a glass from its bottle, when the cork is first drawn.

There are many of this kind in Germany, Spain, Italy, and other countries, but few in England which have hitherto been taken notice of: of the English, the waters at *Ilmington* or *Balemore* in Warwickshire, and those at *Orston* in Nottinghamshire, by the accounts given of them by authors, come nearest to this description; which, together with the German waters of *Spa* and of *Pyrmont*, which are much used in this country, I shall next consider.

1. *Balemore* or *Ilmington*,

In Warwickshire, on the borders of Worcestershire. This is a very fine and clear chalybeate water. Dr. Derham, in his account published of it in 1685, says that it is in a fermenting state at the spring head, and sparkles in a glass like bottled cyder newly emptied. Dr. Short, who evaporated this water, says, that a gallon yielded twenty grains of solid matter, nine of which
were

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were ochreous earth, the remainder a salt, the nature of which he does not mention, though Dr. Derham calls it alkaline. If exposed to the air, it loses its chalybeate qualities in 24 hours. It bears carriage in well-corked bottles, and will keep good for a fortnight. It is drank at the well, from a pint to two quarts in a morning.

2. *Orston,*

In Nottinghamshire. The spring is situated a few miles from Thoroton. Dr. Short says that this is a fine clear water, which has a delicious, gently rough chalybeate taste, and a slight smell of sulphur as it rises in its basin; and that it is replete with a mineral spirit to a prodigy, for, when taken up in a glass, it sparkles and flies, and makes the heads of those who drink it at the fountain, giddy. A glass of it let stand in the open air for a night, still retains the ferruginous qualities in the morning; but if let stand long it lets drop its ochre and loses them, and acquires a rough, harsh, disagreeable taste; and the ochre which it drops,
if

if put on a red-hot iron, sparkles, stinks, and throws out a blueish flame.

The Doctor evaporated a gallon of it, and had remaining 136 grains of solid matter; of which 102 grains were earth of the calcarious kind mixed with ochre, and 32 grains of calcarious nitre (vitriolated magnesia), mixed with a small portion of sea salt.

This water, if drank in large quantity, proves purgative, and it makes the throat, tongue, and stools of those who drink it, perfectly black.

From this account given by Dr. Short, it should seem to be a very brisk, spirity, chalybeate water; and to approach very near, in its properties and impregnating materials, to the Pyrmont water, which I am next to consider; and if his account is just, and it is a water which will keep, it certainly may supply the place of the Pyrmont water, in most cases where it is now ordered.

3. *Pyrmont.*

In the county of Pyrmont, in the circle of Westphalia, in Germany. The spring
is

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is situated at one end of the village of Pyrmont; and the water, as it rises up from its springs, seems to boil in its basin, and when taken up in a glass, it sparkles like the briskest Champagne wine, and to me it had something the taste of old hock, and it had a spirity chalybeate smell; but it did not strike the least shade of red or of purple when mixed with syrup of violets, that I could observe.

When evaporated, it should seem to yield different quantities of solid matter at different times, for every analyzer mentions his having got a different proportional quantity.

		grains
Dr. Hoffman	got in proportion of	106 from a gallon.
Dr. Turner	_____	176
Dr. Ruty, at one trial	109 gr. at	} 160
another	_____	
Sir T. Bergman, above	_____	200
and so forth.		

Dr. Ruty mentions, that the residuum he obtained was of a pale-brown colour, had a nauseous bitter taste, and did not moisten in the air; and that about one third of it was a calcarious nitre (i. e. vitriolated magnesia) mixed with a pittance of sea-salt,
and

and that the remainder was made up of felenites, calcarious earth, and ochre.

Sir Torbern Bergman, who analyzed this water, says, that the Swedish kanneful (containing 42,351 grains of this water) is sometimes impregnated with ninety cubic inches of aerial acid; though in general the quantity is smaller, which is in the proportion of $130\frac{1}{2}$ cubic inches from the English gallon of 61,440 grains; and the solid contents were as follow:

From the Swedish kanne—grains; which is from the *English gallon.*

Of aerated iron	-	$3\frac{1}{4}$	above	$4\frac{3}{4}$ gr.
Of aerated lime	-	20	—	$29\frac{1}{4}$
Of vitriolated lime, felenite	-	$38\frac{1}{2}$	—	$55\frac{1}{2}$
Of aerated magnesia	45	—		$65\frac{1}{4}$
Of vitriolated magnesia	25	—		$36\frac{1}{4}$
Of common salt	-	7	—	$10\frac{1}{6}$
		<hr/>		<hr/>
		$138\frac{3}{4}$		$200\frac{67821}{123858}$

From what has been said, it should seem that the quantity of solid contents is very different at one time from what it is at another.

At Pyrmont the people generally drink this water by glassfuls in a morning, to the quantity of one, two, three, or more English

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lish pints (pounds), and walk about between each glass. Its common operation is by urine, but if taken in large quantity, it generally proves laxative; and when it has not this effect, and it is wished that it should, it is common to mix with the first glass that is drank in the morning, from one to five or six drams of some purging salt.

4. *Spa.*

The Spa waters, brought from the bishoprick of Liege in Germany, have long been in great repute, and much used in England.

There are a number of different springs at Spa, but the waters of two of them are most drank by the company who resort thither, to wit, those of the *Pohoun* and *Geronsterre*. The Pohoun spring rises in the middle of the village; the Geronsterre about two miles south of it. The waters of both are of the brisk chalybeate kind; the Geronsterre is alleged to have more of a sulphureous smell, to be brisker at the fountain, and to be more apt to make people giddy, than any of the other waters here.

As

As I have taken particular notice of the waters of all the springs at Spa in my Treatise on Mineral Waters, I shall here only treat of the *Pohoun*.

Sir Torbern Bergman says, that it does not contain one half of aerial acid that the Pyrmont water does; for a kanne of it yielded only 45 cubic inches.

Dr. Lucas, who analyzed the Spa waters on the spot, mentions his having one morning put a tea spoonful of syrup of violets into two ounces of the Pohoun water, just as it was taken up from the fountain; and that immediately upon mixture, it struck a rose purple colour; which instantly vanishing, left it of a pale blue; and in a minute after, it changed to a sea green, first on the surface, and presently all over; and he adds, that the recent water changed the colour of paper dyed blue by means of the juice of tournsol, first to a crimson, and then to a pale red; and Sir Clifton Wintringham, physician to his Majesty, told me, that he was present when Dr. Lucas performed these experiments.

By Dr. Lucas's analysis, it appears that

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a gallon

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a gallon of the Pohoun Spa water contains,

Of a martial earth,	8 Grains.
Of calcarious earth,	$5\frac{1}{2}$
Of felenites, - -	$3\frac{2}{5}$
Of alkaline salt, -	$7\frac{1}{5}$

$23\frac{9}{10}$

Besides a pittance of oily matter common to all waters.

By Dr. Rutty's account, it appears, that the quantity of solid matter in the Pohoun water varies considerably at different times; so that a gallon has yielded at one time 32 grains; at another 37 grains; at a third 48 grains; and a fourth 80 grains.

Sir Torbern Bergman, who evaporated this water since Dr. Rutty, says that the Swedish kanne contains,

<i>From the kanne,</i>	<i>which is</i>	<i>from the gallon.</i>
Of aerated iron, - -	$3\frac{1}{4}$ grains.	4 and above $\frac{3}{4}$
Of aerated lime, - -	$8\frac{1}{2}$ - -	12 and above $\frac{1}{3}$
Of aerated magnesia,	20 - -	29 and above $\frac{1}{5}$
Of min. alkali crystallized,	$8\frac{1}{2}$ - -	12 and above $\frac{1}{3}$
Of common salt, -	1 - -	$1\frac{1}{224}$
	<hr/>	<hr/>
	$41\frac{1}{4}$	$59\frac{1}{224}$

The analysis given by Monf. Monet differs a good deal from that of other later authors. He evaporated twelve Paris pints of the Pohoun, which, after coming to a boiling

heat, dropt thirteen grains of iron, mixed with an absorbent earth, which he separated; and afterwards, on renewing the evaporation, the water continued to drop an earthy matter like talc, till a little of it only remained; when he again filtered, and separated the earth, which, together with the absorbent earth that had dropt with the iron, weighed sixty-three grains; and on evaporating the small quantity of water which remained, he obtained eight grains of an alkaline salt. The earth, he says, on trial, proved to be a compound of absorbent and argillaceous earths, and of magnesia; and the salt, contrary to his expectation, proved to be of the vegetable and not of the fossil kind; for, on being saturated with the vitriolic acid, it produced a tartarus vitriolatus, and not a Glauber salt, as most other authors have alleged. These facts deserve the attention of those who may have an opportunity of examining these waters at the fountain.

The operation of this water is principally by urine, and it is drank by a glassfull at repeated times in a morning, for the same purposes as other brisk chalybeate waters,

S E C T. V.

Of purging Chalybeate Waters.

THERE are many chalybeate waters in this country, which contain such a quantity of vitriolated magnesia, commonly called Epfom salt, or of marine salt, as to render them purgative; five only I shall take any notice of; three impregnated with the vitriolated magnesia, to wit, 1st. The *Cheltenham*; 2d. The *Jessop*, or *Stoke*; 3d. The *Scarborough*, and two impregnated with sea salt; 4th. The *Filab*; and, 5th. The *Stanger*.

1. *Cheltenham.*

This spring rises near to the village of Cheltenham, which is six miles from the town of Gloucester. Its water is of the purging kind; and one of the most noted in England. It is clear and colourless as taken up from the fountain, has a saline, bitterish, chalybeate taste; and it strikes a pale but vivid purple colour, immediately on being mixed with an infusion of galls.

When

When exposed to the air in an open glass vessel, it throws up a quantity of air bubbles, becomes turbid, and loses its brisk chalybeate taste, and property of tinging with the infusion of galls.

Dr. Short evaporated this water repeated times, and says, that he obtained different quantities of solid matter each time. The first time he got 747 grains from a gallon; of which 74 were calcarious earth mixed with ochre, and 673 grains of a purging salt, vitriolated magnesia. The second time he got 622 grains; of which 42 were earth, and 580 purging salt. The third time he got 692 grains, of which 70 were calcarious earth, and 622 purging salt.

Dr. Ratty, who evaporated this water since, got only 528 grains, of which 36 were earth, and 494 grains salt, composed of vitriolated magnesia, and a small quantity of sea salt, which took twenty-four times its own weight of water to dissolve it.

Dr. Lucas had remaining 544 grains of solid matter from the gallon, of which

K 3

Four

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Four grains were iron,
181½ grains calcarious earths, mixed with
a small portion of felenites, and,
362½ grains of salt, of the nature of Ep-
som, but dryer and firmer.

Dr. A. Fothergill, by his analysis of this water, makes the salt to be a native Glauber, mixed with a portion of Epsum salt.

This water is drank from one to three pints, as a purge; though, in general, from half a pint to a quart is sufficient. It operates with great ease.

2. *Jessop, or Stoke.*

This water rises into a small bason, called Jessop's Well, which is situated on Stoke Common, three miles from Claremont, in Surrey. It is a strong purging; but a weak chalybeate water; it has a nauseous bitter taste, and strikes a weak reddish colour when mixed with an infusion of galls, immediately after being taken up from the spring.

Dr. Hales evaporated a gallon of this water in a dry season, and had remaining 656 grains of solid matter, of which only 11th part, or between five and six grains were earth, the rest salt; in a wet season, the same quantity

tity of water only yielded 480 grains, or one ounce.

Dr. Rutty got 742 grains from a gallon, of which about six grains were earth, the rest a saline matter; to wit, a vitriolated magnesia; with the mixture of a very small portion of sea salt: this salt, on being dissolved and crystallized, shot into prismatic crystals, which kept their form and firmness for years.

This water, drank from a pint to a quart in the morning, generally purges. Dr. Hales, in his account of this water in the *Philosophical Transactions*, No. 495, mentions a particular circumstance of the person who cleaned this well at different times. He stood in it bare-legged for some hours, and was severely purged for a week thereby. Does not this accident point out a method of procuring stools by bathing the feet in purging waters, in cases of obstinate costiveness, where all purgatives are vomited up, and clysters have had no effect?

3. *Scarborough,*

In Yorkshire. The purging chalybeate

K 4

waters

waters of this place have long been much frequented. There are two springs here of the same sort of water, but the one is a little more purgative than the other. They are both brisk spirity chalybeate waters; the one that contains most of the purging salts, is called the *purging*, the other the *chalybeate*.

By Dr. Shaw's account, a gallon of the *purging water* yields 240 grains of solid matter, which was made up

Of calcarious, bolar, and ochreous earth, and	
of selenites	80 grains
Of vitriolated magnesia	150 grains
Of sea salt	10 grains

Dr. Short evaporated these waters repeatedly, and says, that they are stronger at one season than another; for at one time he got 384 grains from a gallon; at another only 301 grains.

Dr. Lucas, who analyzed them likewise, mentions his having obtained from a gallon 320 grains, made up

Of calcarious earth	52 grains
Of ochre	2 grains
Of vitriolated magnesia	266 grains

The

The salt, he says, was of a more hard and consistent nature, than either the salt of the Epsom or of the Cheltenham waters.

Dr. Rutty, who likewise evaporated these waters three times, mentions, that on an average, a gallon yielded 284 grains; and he observes, that the rough purging salt took 96 times its own weight of water to dissolve it, though the same salt, when crystallized, dissolved in about three times its quantity of water.

Four or five half pints of this purging water, drank in the space of an hour, commonly give two or three easy motions, and raise the spirits.

The water of the other spring, called the *chalybeate*, is a brisk water of the same kind, but not so strongly impregnated with a purging salt. Dr. Short; who evaporated it, says, that a gallon yielded him 220 grains of solid matter,

Of earth	-	-	-	70 grains
Of vitriolated magnesia	-	-	-	139 grains
Of sea salt	-	-	-	11 grains

120

4. *Filab,*

A salt chalybeate water, situated six miles from Scarborough; a gallon of which Dr. Short evaporated, and obtained two ounces, or 960 of solid matter, of which 65 grains were earth, and 865 sea salt. Dr. Ratty suspects, that the salt contains a mixture of vitriolated magnesia.

The country people drink a gallon of it in the morning, and it proves strongly purgative and diuretic.

5. *Stanger,*

Situated two miles from Cockermouth, in Cumberland. This is a chalybeate purging water of the same nature as the last; a gallon of which yielded 1170 grains, 90 of which were calcarious earth, and 1080 marine salt, which Dr. Ratty suspects to have a mixture of vitriolated magnesia.

It is drank from pints to a gallon.

S E C T. VI.

Of Chalybeate Waters, containing, or suspected to contain Alum.

UNDER this head, I shall only consider two waters; 1. *The Nevil Holt*; and, 2. *The Somersham*. The first of these is a purging chalybeate; but as it has been suspected to contain alum, I have placed it here: the other has yielded real crystals of alum by evaporation.

1. *Nevil Holt.*

This water is situated near to Market-Harborough, in the county of Leicester; it is exceedingly clear, and void of all smell as it issues from its spring, and has a brisk, austere, bitterish, but not unpleasant taste; and if a bottle be half filled with it, and be then well shaken while its mouth is stopt with a thumb, it throws out a number of air bubbles, and gives a smart explosion on removing the thumb.

When

When it has stood long in the bason, it deposits an intolerable fetid thick jelly, like matter; but if it be kept in well-stopt bottles, it remains clear.

It yields a greater quantity of solid-matter by evaporation, in dry weather than in wet, though rain increases its strength as a chalybeate; for after heavy rains, it strikes a purple colour with an infusion of galls, and gives only faint marks of a chalybeate in a dry season.

Dr. Short says, that in boiling this water to obtain its solid contents, it made a constant loud crackling noise, and dropt most of its earth long before all the water was evaporated; and that the earth may be separated from the ley charged with the salts, by filtering through paper, when the water is reduced to about an eleventh or twelfth part of its original quantity.

Dr. Short mentions his having evaporated this water four different times; and from a gallon he obtained each time different quantities of solid matter: 1. At one time 540 grains; 2. At another, 560; 3. At a third 480; and at a fourth (which he mentions

mentions in his 8vo Treatise, published in 1765), only $310\frac{1}{2}$ grains; and the Doctor tells us, that at this time he evaporated 34 gallons, and that during the boiling, the water dropt six ounces of a fine white, silky, greasy-like earth, in thin snow-white cakes, which he separated, when the water was reduced to thirteen quarts; and then evaporated the remaining water to dryness, and obtained sixteen ounces of a saline matter, which only contained ten more grains of earth.

Upon examining the earth, he found it to be mostly talc or selenite, mixed with a little calcarious earth, sand, or marl; and adds, that the salt, when crystallized, proved to be a nitrum calcarium (*magnesia vitriolata*), which had a greater proportion of acid than salts of this kind commonly have, and that it is a most powerful antiseptic.

From this account of Dr. Short, it appears, that from a gallon,

The greatest quantity he got, was 560 grains of solid matter, which contained,

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Of talk or selenite, mixed with a little

ochre and calcarious earth - - - 152½ grains

Of vitriolated magnesia - - - 407½ grains

And that the least quantity, 310 grains contained,

Of talc or selenite, - - - 86 grains

And of vitriolated magnesia - - - 224 grains

Dr. Ruty likewise evaporated this water repeatedly, and got of solid matter, from 504 to 800 grains; and says, that the proportion of insoluble matter was not near so large as Dr. Short had mentioned; for, instead of a third part, it was never more than one-sixth, and sometimes only an eighteenth part; and he suspected that the salt contained a portion of alum, from its austere acid taste.

This water drank to pints, proves to be a brisk purgative and a powerful diuretic, and it operates more freely when taken up immediately from the fountain, than after it has been kept. It is esteemed to be a powerful antiseptic in putrid disorders; and to be a good remedy in old diarrhœas and fluxes; in hæmorrhages, fluor albus, gleet, and in many other chronic disorders.

2. *Somersham,*

2. *Somerſham,*

In the county of Huntingdon. The ſpring of this water riſes from the declivity of a ſmall hill, between St. Ives and Somerſham. Many mineral waters have been ſuſpected to contain alum; but this is the only water in England from which it has hitherto been got. In the year 1766, Dr. Layard, phyſician to her late Royal Highneſs the Princeſs of Wales, publiſhed an account of this water, in the 56th volume of the Philoſophical Tranſactions.

This water, taken up from the fountain in a dry ſeaſon, is quite clear, and full of ſparkling air bubbles, and has a brisk, pungent, ferruginous and ſomewhat inky taſte, but not in the leaſt diſagreeable. If let ſtand in an open glaſs, it lets drop in a few hours an ochry ſediment, but continues clear and transparent; and then, after being kept for months in bottles only half full, it ſtill turns purple on the mixture of an infuſion of galls, though in a leſs degree; from whence it is evident, that part of the iron is ſuſpended by aerial acid, and part by a more fixed vitriolic.

Four pounds evaporated in a dry season, yielded from sixteen to twenty grains of rusty orange-coloured sediment; and after rainy weather, the same quantity of water has yielded two drams of a dark olive-coloured residuum. Hence in dry seasons, a gallon yields by evaporation, from 36 to 40 grains, and in wet seasons has yielded four drams (or half an ounce).

Dr. Morris, at the request of Dr. Layard, analyzed the water; he put a quart (lib. ii.) of it into a retort, and drew off eight ounces, which differed in nothing from common distilled water; he then put the remainder into a stone basin, and set it by for a night, and in the morning he found that it had dropt near four grains of a yellow sediment, which, after being separated, on trial proved to be ferruginous. The remaining liquor was then allowed to evaporate by the heat of the atmosphere, in the month of August; and pellicles of sekenites formed successively on the surface; and breaking, fell to the bottom; and continued to do so, till there remained only two ounces of the liquor, which was poured carefully from the pellicles into a cup; and the pellicles,
on

on being dried and examined, were found to be true selenites, and the whole weighed 30 grains. After this, the two ounces of water being allowed to evaporate, left five grains of regular crystals of alum, interspersed with a whitish powder; the powder soon attracted moisture, run per deliquium into a brownish subacid austere liquor, which had a ferruginous and saline taste, and seemed to be a salited magnesia, with a little alum and vitriol, in the state of an aqua magistra aluminis et vitricli.

From this account it appears, that the water evaporated by Dr. Morris, yielded from a gallon,

1. Of ochreous earth, which it dropt			
after heating	-	-	16 grains
2. Of selenites	-	-	120 grains
3. Of alum	-	-	20 grains

And some white powder, the quantity not mentioned, which run per deliquium, and should seem to be a bittern or salited magnesia, mixed with alum and vitriol.

The Somersham water is drank in a morning the length of three glasses, at half an

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hour's distance from each other; but some persons can drink a pint or more. Dr. Lazard recommends to purge before beginning a course of these waters; and says, that during the course it may be occasionally mixed with purging salts; and that it may be warmed with powdered carvy or cardamom seeds.

It has been much recommended in debility of the stomach and bowels, in dysenteries, in the diabetes, in profuse hæmorrhages, in cases of worms, and in many other disorders.

C L A S S I I I.

Of sulphureous Waters.

THE last class of cold waters which I shall consider, are those which contain sulphur.

Sulphureous or hepatised waters have a smell of hepar sulphuris, tinge silver of a yellow or of a black colour, and deposit a genuine sulphur in the channels through which they

they pass; though for many years the most minute and accurate analyzers had not been able to discover the least particle either of sulphur or of hepar sulphuris in them; but the chymical researches of more modern times have been able to explain this mystery; and to demonstrate that hepar sulphuris (made by fusing sulphur and an alkaline salt together); and likewise sulphur combined with iron, generate on the addition of the strong vitriolic acid, a species of vapour, commonly called hepatic air, which, Sir Torbern Bergman says, is formed by the union of phlogiston, and the matter of heat, with sulphur; and that the sulphur is rendered misceable with water, and kept suspended in it by means of these two subtile agents; and that when they either evaporate, or are attracted by substances which have a greater affinity with them than sulphur, then the water, being no longer able to keep the sulphur suspended in it, lets it drop to the bottom, where it is found in form of real sulphur.

Atmospheric air and the nitrous acid, both powerfully attract phlogiston; and hence, when water impregnated with hepatic air is

exposed in an open vessel, the air of the atmosphere attracts and unites with the phlogiston, and the water lets drop its sulphur; which either falls to the bottom, or attaches itself to the sides of the vessel in which it is contained; and hence sulphur is found in the bottom of wells of sulphureous waters, or attached to the sides of pipes or conduits through which it runs. And if pure nitrous acid be added to a sulphureous water, or water impregnated with hepatic air, it immediately attracts the phlogiston, and the sulphur precipitates to the bottom of the water.

Sir Torbern Bergman, in order to ascertain the quantity of sulphur which water was capable of suspending by these means, saturated a kanne (100 Swedish cubic inches) of distilled water with hepatic air; and he found that the water took up about 64 cubic inches of this fluid vapour; and that when decomposed by means of the nitrous acid, it let drop eight grains of sulphur.

Dr. Dejean, of Leyden, being in Aix-la-Chapelle in the year 1777 (as I formerly mentioned), and suspecting that the sulphur
in

in the waters there was dissolved and kept suspended by means of fixed air, mixed with some of the water of the Emperor's Bath a solution of arsenic in the marine acid, and immediately the water let drop a true and genuine sulphur, which convinced him that the water was impregnated with sulphur in the manner he had suspected.

These experiments of Sir Torbern Bergman and Dr. Dejean, prove beyond a doubt, that sulphur is really and substantially dissolved in those waters called sulphureous, and that it may be separated from them in the same manner as earth or metal, from earthy or metallic salts, by means of elective attractions.

There are many sulphureous waters in this country, which are variously impregnated with other materials besides sulphur; for there is scarce any substance which mineral waters have been found to contain, that has not been met with in some sulphureous water or other; however, I shall only mention a few under the three following heads. 1st. Of common and sulphureous waters. 2d.

Of purging fulphureous waters. 3d. And
of chalybeate fulphureous waters.

S E C T. I.

1. *Common sulphureous Waters.*

UNDER this head I shall treat of a few
fulphureous waters, which neither are chaly-
beates, nor contain such a quantity of salts,
as to render them purgative when taken in
moderate quantity, but whose common ope-
ration is by the kidneys or skin; which
are,

- | | |
|-----------------|------------------|
| 1. Askeron. | 8. Rippon. |
| 2. Cawley. | 9. Sutton Bog. |
| 3. Durham. | 10. Wardrew. |
| 4. Keddlestone. | 11. Corstorphin. |
| 5. Normanby. | 12. Castle Loed. |
| 6. Nottingham. | 13. Fairburn. |
| 7. Quin Camcl. | 14. Moffat. |

1. *Askeron.*

Five miles from Doncaster in Yorkshire,
at Askeron, in the parish of Campsel, is a
spring of an exceeding clear water, which
tastes and smells of sulphur; and the channel
of its stream is commonly full of a thick
white sludge.

Dr.

Dr. Short evaporated this water, and got 144 grains of solid matter from a gallon of it; 48 grains of which, he says, were nitre (vitriolated magnesia), 96 grains were earth, the nature of which he does not particularly mention.

The Doctor says, that it is a very diuretic light water, which has performed many eminent cures, both by bathing and drinking, in the scab, the leprosy, and in inveterate scrophulous and other sores.

2. *Carwley,*

A mile from Dranefield, in Derbyshire, is a clear sulphureous water as it rises from its spring, but becomes black by standing, and yet it turns every extraneous body in its basin of a very white colour.

Dr. Short evaporated this water, and got about 39 or 40 grains of solid matter from a gallon, whereof 9 grains were earth, the rest vitriolated magnesia.

3. *Durham.*

This sulphureous water is situated near to Durham, on the north side of the River

L 4

Ware;

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Ware; it comes out of a rock, is clear, and has a strong sulphureous smell. Dr. Short evaporated a gallon of it, and had remaining a residuum which weighed 56 grains, 18 grains of which were light calcarious earth, and 38 grains sea salt.

In the middle of the river Ware, near to this sulphureous water, is a salt spring, the water of which is purgative.

4. *Keddlestone.*

In the middle of the park of Keddlestone, three miles from Derby, is the strongest sulphureous water in the county; it is extremely clear at the fountain, but by standing becomes blackish; and it presently turns silver of a black copper colour.

Dr. Short says, that it lost its sulphureous smell in well stoppt bottles in the space of twenty-four hours. Dr. Short obtained 80 grains of solid matter from a gallon, of which 42 grains were earth, 38 grains were marine salt.

5. *Normanby,*

Four miles from Pickering, in Yorkshire, is a very clear sulphureous water, which
seems

seems highly impregnated with a mineral spirit, for it sparkles like Champagne wine when poured out. By evaporation, Dr. Short says, that it only yields about 30 grains of solid matter from the gallon, and often not that quantity; the saline matter of this sediment is made up of two parts of magnesia vitriolata, and one of marine salt. Near it is a chalybeate water, called *Nether Normanby Spa*; a gallon of which afforded 10 grains of sea salt.

6. *Nottingham.*

At Nottingham, in Dorsetshire, is a strong sulphureous water, which Dr. Ruty evaporated, and obtained 42 grains of solid matter from the gallon, which was made up of thirty grains of natron, and seven of earth.

7. *Quin Camel.*

The spring of this water is situated south of Castle Cary, in the county of Somerset, on the borders of Dorsetshire; it issues from a hard rocky bank, and is called the Black Well, because its water tinges the stones on which it falls of a black colour.

Dr.

Dr. Ruttty evaporated this water after it had been sent to Dublin, and obtained 64 grains from a gallon, which was composed of a calcarious earth, natron, and sea salt, mixed with sulphureous matter.

This water is much used in the cure of cutaneous and scrophulous disorders.

8. *Rippon,*

In Yorkshire. Near this place a spring of a pretty strong sulphureous water, rises from a spring on a lime-stone hill, the water of which, when evaporated, left 66 grains of solid matter from a gallon, near one half of which was earth, the other sea salt,

9. *Sutton Bog.*

The spring of this water is situated in the county of Oxford, near Northamptonshire; the water is intolerably fetid, with a saltish, pungent, lixivial taste.

Dr. Short obtained 140 grains of residuum from a gallon; and Dr. Ruttty got nearly the same quantity; 9 grains were earth or clay, 131 grains a salt, which Dr. Ruttty
I
found

found on trial to be a native alkali, mixed with sea salt.

If drank in large quantities, it proves laxative; and it is used in scrophulous and cutaneous disorders, and in foul ulcers, and other complaints, both internally, and as a bath.

10. *Wardreth.*

The well of this water is situated in the county of Northumberland, on the banks of the river Arden, near to the borders of Cumberland. It is one of the most noted sulphureous waters in the three northern counties.

It has a strong smell, but loses both its taste and smell by carriage and by keeping. Dr. Short got only 25 grains of solid matter from the gallon, of which three were a light calcarious earth, the rest sea salt.

11. *Corstorphin.*

The spring of this water is situated in the middle of the village of Corstorphin, two miles from the city of Edinburgh, in the county of Mid-Lothian, in Scotland.

This

This is a weak sulphureous water, which yielded Dr. Short only two grains of solid matter from a gallon, four of which were clay, seven grains sea salt and vitriolated magnesia mixed.

This water has been much used for the cure of scrophulous complaints.

12. *Castle Loed,*

In Rosshire, Scotland. At this place there is a spring of strong sulphureous water, which has been in great repute for many years.

In summer 1771, the late Sir John Gordon of Invergordon sent me six bottles of this water, and as much of the mineral sulphureous water of Fairburn, which is scarce two miles from Castle-Loed; both of which I analyzed, and gave the Royal Society an account of the analysis, accompanied with a letter from Dr. Alexander Mackenzy, physician at Cromarty, which were published in the sixty-second volume of the Philosophical Transactions for 1772.

Dr. Mackenzy says, “ that the Castle-Loed is a very strong sulphureous mineral
“ water.

“ water. That when taken up from the
“ spring, it is as pure and transparent as the
“ clearest rock water ; but if kept in an open
“ vessel, or in an ill-corked bottle, it soon
“ becomes of a milky sort of foulness, and
“ it loses its sulphureous smell in twenty-
“ four hours.

“ The bottom of the well, and of the
“ channel which conveys its water from
“ thence, is black, as if dyed with ink ; and
“ the leaves of the aller bushes that fall into
“ the well, and into its channel, soon con-
“ tract a blackish colour in the water ; but
“ when taken and dried in the sun, or in
“ the shade, appear covered with a whitish
“ dust, which is undoubtedly sulphur ; for
“ by burning one or more on an ignited
“ shovel, or clear live coal, they produce
“ a blue flame, and emit a very suffocating
“ sulphureous smell.”

From the analysis I made of this water, the particulars of which are to be seen in the sixty-second volume of the Philosophical Transactions, it appears, that four pints (pounds of 16 ounces) 7 ounces and 6 drams of this water being evaporated, very soon let drop about
one

one grain of absorbent earth soluble in acids. That from the time it became hot, till it was reduced to less quantity than an ounce, it let drop fifteen grains of selenites; that the remainder evaporated to dryness, left seventeen grains of a yellow saline matter; that this saline residuum being thrown into distilled water, which was filtered, evaporated, and crystallized, afforded twelve grains of pure crystals of true Glauber salt, and left about nine grains of saline matter, mostly Glauber salt, which did not crystallize, owing to a mixture of an oily matter, and probably of a little marine bittern, for some of the vitriolic acid being dropt upon it, it emitted acid fumes. That on examining the paper-coffin through which the saline residuum, after being dissolved in distilled water, had been filtered, it was found, after it was dried, to weigh two grains more than before it had been used; and it was observed to be covered on its inside with a yellowish powder; and on rubbing a shilling with the inside of a piece of it, it tinged it of a yellow colour, as flowers of sulphur would have done; and upon lighting a bit of the
coffin

coffin with a candle, and then extinguishing the flame, it smelt strong of sulphur.

From this account, it appears that a gallon of the water contains about 59 grains of solid matter, made up

Of absorbent earth	- -	$1\frac{4}{5}$ grains
Of selenites	- -	$26\frac{3}{5}$ grains
Of saline matter	- - -	$30\frac{1}{5}$ grains

the greatest part of which is true Glauber salt, mixed with a pittance of sulphur, and probably with a very small portion of marine bittern.

Dr. Mackenzy gave the following account of its operation: he says, “ all that I can
“ learn of the operation of this water, from
“ some sensible people of credit and observa-
“ tion, who have drank it this as well as
“ former seasons, is, that it very sensibly in-
“ creases the urine, and sometimes remark-
“ ably opens the pores; but I do not find
“ from the report of any, that it purges,
“ though drank to the quantity of three,
“ sometimes of four English quarts in the
“ day. Almost every person who drinks it,
“ remarks, that it whets the appetite, and
“ fits

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“ fits light on the stomach ; I have been told
“ by several, that they have had head-achs
“ immediately after drinking their morning
“ bottle, but of no long duration, nor to any
“ great degree.

“ It is impossible to say with certainty the
“ numbers of cures these waters have made,
“ or what particular cases have received most
“ benefit from using them ; I have indeed
“ myself directed people with various com-
“ plaints to drink them ; some very foul
“ faces have been quite cleared ; the herpes
“ has been removed ; the erysipelas re-
“ ceived benefit, foul ulcers cured,” &c.

And I have been informed, that many of those cutaneous disorders, called scorbutic, have been removed by their means ; and that they cure the itch.

As this water contains but a small quantity of purging salt, and does not operate by stool, some purging salt may be occasionally added to the first glass that is taken in the morning ; and if equal parts of this water and of sea-water be mixed, they will form a purging sulphureous water very similar to that of Harrogate.

13. *Fairburn.*

The spring of this water is likewise in the county of Ross, in Scotland, about two miles from the Castle-Loed well. This is also a strong sulphureous water, something of the same nature, but not so strong; I evaporated a gallon of it, and had remaining 41 grains of solid matter, made up

Of absorbent dark-coloured light earth,	2 grains
Of white calcarious earth, ———	15 grains
Of Glauber salt mixed with yellow matter, &c. ———	} 24 grains
	<hr/> 41 grains

but I got no selenites.

It is used for the same purposes as Castle-Loed water, but is not so much frequented.

14. *Moffat.*

About half a mile south of the village of Moffat, in the county of Anandale in Scotland, are two springs of sulphureous water. The upper well is the strongest and the most nauseous, and therefore is not drank so commonly as the other; but as it bears heat better, it is more used for bathing in.

Both Dr. Plummer and Dr. Short evaporated these waters, and they obtained nearly equal quantities of solid matter from them; between 54 and 55 grains from a gallon, which was made up

Of earth, — 3 grains,
Of marine salt, 50 grains;

which Dr. Short alleges is not all marine salt, but contains a small portion of vitriolated magnesia.

Dr. Plummer, from examining the strata of the earth in the neighbourhood of the wells, suspected that the waters might contain some small portion of copper, but could discover no vestiges of it by any experiments he made; but since his time, the Rev. Dr. Walker, who was formerly clergyman of the parish, in order to try if there were any grounds for Dr. Plummer's suspicions, put a fine polished plate of iron into the well, and let it remain there for some time; and it contracted a green rust, which he looked upon as a proof of copper in the water.

This water proves mostly alterant and diuretic. When drank in large quantity, it
often

often loosens the belly, and sometimes it purges. Like other sulphureous waters, it has been much used in scrophulous and in cutaneous disorders.

S E C T. II.

Of purging Sulphureous Waters.

THERE are a great many sulphureous waters impregnated with such a quantity of vitriolated magnesia, or of marine salt, as to prove laxative or purgative, in different parts of England, six of which I shall here mention :

1. *Croft.* — 2. *Harrogate.* — 3. *Maudslay.* — 4. *Shap-moor.* — 5. *Sutton-Bog.* — 6. *Upminster.*

1. *Croft.*

The spring of this water is situated in Yorkshire, on the confines of Durham, and near to Darkington. It is a fine, clear, sparkling water, which smells very strong of sulphur ; and its stream does not rise or fall by rain or drought.

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Dr. Short evaporated this water, and got from a gallon 190 grains of solid matter, made up

Of light calcareous earth,	150 grains,
Of vitriolated magnesia,	30 gr.
Of sea-salt,	— 10 gr.

Dr. Short says, that it is drank in a morning from two to nine pints ; and has performed several remarkable cures.

2. *Harrogate,*

Situated near to Knaresborough, in the county of York. This is a salt, purging, sulphureous water, the most frequented of any of the kind in England, and has been long in repute.

Formerly there were only three sulphur wells that were known, but about 40 years ago a fourth was discovered ; and in the year 1786 the Right Rev. Richard Lord Bishop of Landaff published Observations on these wells, in the 76th volume of the Philosophical Transactions, in which he mentions, that there are a number of other springs round the village.

These

These waters rise up in the wells clear and sparkling ; they throw up a quantity of air bubbles, have a strong sulphureous and salt taste, and have all the properties of sulphureous waters.

Dr. Kelvington, physician at Rippon, who attended these waters in the summer for many years, in a letter which he wrote to me in the year 1768, mentions their being perfectly limpid when taken out of the well, without the least appearance of a cloud in them, or of a scum on their top ; but that if they are exposed to the atmosphere for a few hours, they become turbid, a thin scum gathers on their surface, they drop a whitish sediment, and they lose their sulphureous smell ; and he says, that if they be bottled as taken up from the well, and be firmly corked, without leaving a sufficient space between the cork and the water, that they burst their bottles.

Dr. Neale had mentioned, that one time, on raising the stones in the bottom of the well, genuine flowers of sulphur were found adhering to their lower surface. Dr. Short had affirmed, that both the mud taken from

the bottom of the wells, and the scum which gathers on the surface of the water exposed to the air, contain sulphur; for that, if they be dried, and then put on a red-hot iron, that they burn with a blue flame, and smell strongly of sulphur; and Dr. Shaw has told us; that these waters contain actual sulphur floating in them like feathers, and separable by bare straining; and the matter so collected, he says he has found, by proper trials, to be good brimstone. However, the truth of these facts had been doubted by many; but in the year 1774 I received a letter, dated the 3d of May, from Dr. Kelvington, mentioning, that he now believed that the Harrogate water contained real sulphur, for that the day before (May 1st) having been at the wells, which had not yet been cleared for the approaching summer, he observed a circle of a yellowish concretion all around the margin of the basin, as high as the water rose, which he did not remember to have noticed before, a small part of which he scraped off and dried; and on putting a little of it on a red-hot iron, it produced a blue flame, and smelt strong
of

of sulphur. Since that time, the Right Rev. the Bishop of Landaff has put that matter beyond a doubt, and confirmed the accounts given by Drs. Neale, Short, and others. He examined the scum which the water had thrown up, the mud or sediment which they dropt, and the substance which he scraped off the inside of the bason, and by every trial found that they contained real sulphur which had been separated from the waters; and to ascertain the existence of sulphur more certainly, he took a quantity of matter which he had scraped from the inside of the bason, and, after having washed it well and dried it thoroughly, he put two ounces of it into a retort, and sublimed from it two or three grains of yellow sulphur, which had an oily appearance: when the retort was opened, it had not only the smell of a volatile sulphureous acid, but likewise the strong empyreumatic smell which peculiarly attends burnt oils; from whence he concludes, that this water, besides sulphur, contains an oily matter.

The waters of the different springs should seem, by Dr. Short's account, to be nearly

of the same strength with respect to their sulphureous qualities, though the quantity of saline matter be different in each. He evaporated a gallon of each of the three old springs.

1. From the first, or strongest, he obtained three ounces of solid matter, mostly sea salt, which is about half the quantity which sea water affords; the salt contained about forty grains of earth (or two scruples).—The bishop thinks that the quantity of salt is rather under than above two ounces.

2. A gallon of the middle well yielded only half an ounce of solid matter; seven scruples (140 gr.) were earth, the rest sea salt.

3. A gallon of the third, or lowest well, yielded an ounce and a half of residuum, of which 17 grains were earth.

By Dr. Rutty's experiments with the salt, it should seem to have a small mixture of bittern, or of vitriolated magnesia.

The Harrogate waters are drank from half a pint to three quarts, or more. In
small

small quantity, they prove diuretic ; in large, strongly purgative.

Like other saline, purging, sulphureous waters, they have been much used, and are extremely serviceable in cutaneous and in scrophulous disorders. They have been found to be amongst the best remedies for destroying and evacuating worms and their nidus ; and to be extremely useful where the digestion has been bad, and the stomach and intestines been full of viscid matter ; and they have been found to be serviceable in many chronic complaints. They have been likewise much employed for external use, by way of washes, fomentations, and baths, particularly in cutaneous disorders.

3. *Maudsley.*

This well is situated near Preston in Lancashire ; its water is nearly of the same nature as that of Harrogate : it is salt and sulphureous, and contains about two ounces of marine salt, the same quantity as the strongest Harrogate water.

4. *Shap-*

4. *Shap-moor,*

Situated between Shap and Orton, in the county of Westmoreland. This is a very strong and clear sulphureous water.

Dr. Rutty, who evaporated it, says, that a gallon yielded 376 grains of solid matter, made up of six grains of earth, and 370 grains of a saline mass composed of vitriolated magnesia, sea-salt, and natron; but he does not mention the quantities of each.

Three pints of this water prove purgative.

5. *Sutton Bog,*

Oxfordshire. The spring of this water is situated in the parish of King's Sutton, just contiguous to the village near Banbury.

The water is very fetid, and has a saltish, pungent, lixivial taste. Dr. Short, who evaporated it, got from a gallon 140 grains of solid matter, of which 9 grains were earth, 131 grains of a salt which he calls a peculiar sort of nitre, but which Dr. Rutty has
since

since proved, by experiments, to be a compound of sea-salt and natron.

This water is recommended as being laxative and diuretic, and useful in scrophulous and cutaneous disorders.

6. *Upminster.*

This is a strong sulphureous water, situated near to Brentwood in Essex, about 21 or 22 miles from London. It is clear and bright, and Dr. Rutty says it remained so, and kept its strong sulphureous smell, and other sulphureous properties, after being carried in bottles to Dublin. The Doctor evaporated this water, and got 132 grains of solid matter from a gallon, composed of insoluble matter, vitriolated magnesia, and natron, the proportion of which Dr. Rutty does not mention.

The water is purgative and diuretic in its operation, and is drank in a morning from a pint to quarts.

S E C T. III.

Of Sulphureous Chalybeate Waters.

MOST chalybeate waters have more or less smell of sulphur, owing probably to a portion of hepatic air being disengaged from pyrites, or other ores of iron, during the solution of the iron in the bowels of the earth, by means of water impregnated with aerial acid; but at present I shall only mention three of these waters, which have such a strong sulphureous smell as to have been called sulphureous; which are,

1. The *Deddington*. 2. *Gainsborough*.
3. *Inglewhite*.

1. *Deddington*.

The well of this water is situated at Deddington, a small market town in the county of Oxford, four miles from Banbury. This is a brisk chalybeate water, which has a strong sulphureous smell, like to that of the washings of a foul gun; but it soon loses both its sulphureous and chalybeate

beate properties by being exposed to the air ; and it does not bear carriage.

Dr. Short, who evaporated this water, got from a gallon 87 grains of solid matter, of which 44 were earth, 43 sea-salt ; but Dr. Rutty, from some experiments made, rather suspects the salt to be natron.

2. *Gainsborough,*

In Lincolnshire. This water springs out of sand, a little to the south-east of the town ; it is a weak sulphureous chalybeate. Dr. Short, who evaporated this water, says, that he got from a gallon 192 grains of solid matter ; of which 120 grains were light calcarious earth, 72 grains vitriolated magnesia.

3. *Inglewhite,*

In the county of Lancaster. This is a strong sulphureous, chalybeate water, which Dr. Short evaporated, and obtained from the gallon of it only 24 grains of solid matter ; 19 grains of which, he says, were ochreous earth, 5 grains vitriolated magnesia.

C H A P. IV.

S E C T. I.

OF WARM MINERAL WATERS.

HAVING taken notice of some of the most remarkable cold mineral waters of Great Britain, and of two or three of the foreign waters, which are yearly brought to London in large quantity ; I shall next, before quitting this subject, mention so far of the nature and contents of the British warm mineral waters, or baths, which are only four in number, as to give an idea of their general virtues and properties, and shall mention only a few things relative to baths in other parts of the world.

Warm mineral waters, as I before observed, are heated either by subterraneous fire, or by heat generated by the mixture of water with certain mineral substances in the bowels of the earth ; in which manner the waters of this country should seem to be heated, as at present there are no volcanoes, or other appearances of subterraneous fire, any-where in this island.

Before entering into the account of the particular waters, it may be necessary to observe,

1st. That it appears from the records of medicine, that the waters of hot springs have been drank, and used as baths, for the cure of diseases in the most early ages, and that their use has been continued for the same purposes to this day.

2dly. That as they have been much used by all nations, even the most barbarous, most of them have been called by the name of *baths*.

3dly. That as the fall of these warm waters, on particular parts, has been found to cure local disorders, pumps and other contrivances have been made use of to raise the water, that it might fall with force on the diseased parts; and such falls have been called by modern Latin authors *Balnea ad Ducciam*, & *ad Stillicidia*; and by the English, *Pumps* and falls of water.

4thly. That for the same reasons, different means have been tried to confine the vapour or steam of hot water, so that it may be applied either to the whole body, or
to

to particular parts; and the places where such vapours have been confined, have been called *Vapour Baths*, and by modern Latin authors, *Stuphæ*.

5thly. That a mud or sediment, impregnated with mineral substances, is often found in the bottom of baths, or reservoirs of such warm waters, which assists in removing pains and aches, and paralytic and other complaints, from parts put into it, or by being rubbed on such parts; and when this mud or sediment is collected in quantity in a reservoir or basin, it has been called *Balneum Luti*, and by the English, *Mud-Bath*.

6thly. That in the neighbourhood of waters heated by subterraneous fire, the earth is commonly hot for a considerable way round; and the inhabitants in the neighbourhood often dig pits or caverns, in places of a proper heat, which serve as sudatories for patients who labour under dropsies, rheumatisms, palsies, and other diseases which require sweating. Sometimes the pits are made for receiving only the lower extremities, and sometimes the trunk of the body
4 like-

likewise; and at other times the patients are placed in these pits, and the whole body, except the head, is covered with warm sand or earth; and they remain there till they have sweated profusely. And in some places they make large vaults or caverns with air-holes, which are used as bagnios, the natural heat being sufficient to sweat those who sit in them.

S E C T. II.

THE four natural warm waters of this country are,

1. The *Bath*.—2. The *Bristol*,—3. The *Buxton*.—4. And the *Matlock*.

1. *Bath*.

The city of Bath stands on the north side of the river Avon, in Somersetshire, 108 miles west from London; it has been famed for many ages on account of its warm mineral waters. There are three principal springs or sources at this place: The first is at the *King's Bath*.—2. The second, at the *Cross Bath*.—3. And the third, at the *Hot Bath*.

And the waters which fill these baths supply water for three other baths. The *Queen's Bath* is supplied from the King's; the *Lazar* or *Leper Bath* from the hot Bath: and the *Horse Bath* is filled by the waste water of the King and Queen's Bath.

The waters of the different sources are all nearly of the same nature. As they run from their springs, they are clear, transparent, and sparkle in the glass; they have a pleasant and very slight saline, bitterish, and chalybeate taste: and if an infusion of galls be dropt into them, they strike a rose purple colour; but if they be allowed to stand till the water has become cold, its quality of tinging with galls is sensibly abated, if not intirely lost; and if let stand for some hours, they get a milky, or rather a whey-like appearance, and deposit a pale yellow sediment.

Neither the waters nor their vapour has the least sensible smell as they come from the pumps; but Dr. Lucas says, that sometimes one perceives somewhat of the acid smell of the pyrites, as the baths are filling.

Authors have differed a little with respect
to

to the exact degree of the heat of these waters, but not more than what probably was occasioned by a difference in the thermometers they used; or by some little difference in the manner of performing the experiments; or by a variation in the degree of heat of the waters themselves: for Dr. Charleton, who lived many years at Bath, in his account of these waters, says that they have been found to be of various degrees of heat at different times of trial; that the water of the pump of the Cross Bath had varied from 110 to 105: of the Hot Bath, from 116 to 112; of the King's Bath, from 116 to 114 degrees of Fahrenheit's thermometer.

Dr. Lucas, who seems to be the only person who examined the heat of the springs themselves, alledges, that water of the spring of the King's Bath raised the thermometer to 120,—of the Hot Bath, to 119½,—of the Cross Bath, to 116.

The highest degrees of heat, attributed to the waters of the three pumps, by Mr. Howard, in *Philos. Transf.* vol. 57th, and

by Dr. Charleton and Dr. Lucas, are as follows :

	<i>Mr. Howard.</i>	<i>Dr. Charleton.</i>	<i>Dr. Lucas.</i>
Of pump of King's Bath	113	116	119
Of pump of Hot Bath	114	116	119
Of pump of Cross Bath	108	110	114

Dr. Lucas distilled some of the King's Bath pump water in a retort, and what came over differed in nothing from common distilled water, but the paper which covered the luting was slightly spotted red.

He next evaporated a gallon of these waters, and had remaining 134 grains of solid matter, made up

Of iron	$\frac{8}{37 \text{ or } 38}$	parts of a grain.
Of calcarious earth	$22\frac{1}{2}$	grains.
Of selenites	$31\frac{1}{2}$	gr.
Of Glauber salt	$25\frac{2}{3}$	gr.
Of sea salt.	$51\frac{1}{3}$	gr.

which were mixed with an oily matter, but not more than is common to all waters.

By Dr. Charleton's account, a gallon of these waters yields 136 grains of solid matter composed of $58\frac{4}{1000}$ gr. of insoluble matter, which he calls absorbent earth,—
 $22\frac{356}{1000}$ gr. of nitrum calcarium,—
 and

and $56 \frac{140}{1580}$ gr. of sea salt; hence we see that these two analyzers come near to each other. Dr. Charleton did not separate the felenites from the earth, and he calls the salt nitrum calcarium, which Dr. Lucas calls Glauber salt.

From these accounts it appears, that the Bath waters are chalybeates, in which iron and earth are kept suspended by means of aerial acid, and that they are impregnated with a small portion of felenites, sea salt, and either Glauber salt or vitriolated magnesia.

These waters were for a long time esteemed to be sulphureous, but certainly they have not the least title to that name; they do not affect the colour of silver or metallic solutions, or produce any other effect of water impregnated with sulphur. A late author, however, has imagined that he has proved that they contain sulphur, by their producing, on mixture with certain substances, appearances similar to those produced by the mixture of the same substances with what he calls a strong solution of sulphur; but it is evident from that gentleman's own ac-

N 3

count,

count, that he had been deceived, and that he was using a plain lime water in place of a solution of sulphur, for making his experiments with ; but in order to be certain of the fact, I mixed quicklime and flowers of sulphur, and triturated them with cold water as he directs, and, on filtering the water, found it to be what I had suspected, plain lime water. Had he used boiling water in place of cold, or applied heat to his ingredients when mixed, so as to have dissolved part of the sulphur, he would have found the result of his experiments to have been very different from what it was.

The Bath waters operate powerfully by urine, and promote perspiration ; and if drank quickly and in large draughts, they sometimes purge ; but if taken slowly, and in small quantity, they rather incline one to costiveness, cause a sense of heat, and oftentimes a heaviness of the head, with a propensity to sleep, particularly on first drinking them.

As these waters often heat on first using them, it is right to cool the body by taking a dose or two of some mild laxative medicine,

dicine, and to live on a cooling regimen, before entering into a course of them; and, for the plethoric, to lose a few ounces of blood: and during these courses, to live regular, and, if inclined to be too costive, to take occasionally a dose of some cooling physic.

They are likewise much used for bathing in, and for pumping on paralytic and other diseased limbs.

These waters have been much recommended in disorders of the stomach and bowels, in the gout, rheumatism, palsy, and variety of other complaints.

2. *Bristol,*

In the county of Somerset. About a mile west from the city of Bristol, on the banks of the Avon, is the spring of warm mineral water, the well of which has been called St. Vincent's, or the Hot Well; and about a mile lower down the river, on the same side, is another warm spring called the Merchant's, or New Hot Well.

St. Vincent's, or the *Hot Well*. The water of this well is clear, transparent, and spar-

kles as it is taken up in a glass; it has no particular smell or taste different from common water of the same degree of heat. It loses a little of its pellucidity by being exposed to the air, but keeps well in bottles which are well corked.

The heat of this water, as it rises from its spring, Dr. Lucas says, raises the quicksilver in Fahrenheit's thermometer to 83 and 84 degrees; but Dr. Sutherland alledges, by his trials, only to 76.

By evaporation, a gallon of this water leaves from 38 to 40 grains of solid matter; and Dr. Ruttty tells us, that Dr. Shebbeare once got 56 grains by evaporating the water in a retort, in place of an open vessel.

Dr. Lucas says, that the 40 grains he obtained from a gallon was made up

Of calcarious earth, $11\frac{1}{2}$ grains,—of feltnites, $9\frac{1}{2}$ grains, — 19 grains of a saline matter composed of sea salt, Glauber salt, and vitriolated magnesia,—and an oily matter common to all waters.

This water has been much recommended in the cure of the diabetes, fluor albus, gleans, old diarrhoeas and dysenteries, consumptions,

sumptions, and a variety of other complaints.

It is drank in repeated draughts of four ounces or half a pint, from the quantity of a pint to two quarts in the day.

3. *Buxton,*

A village in the Peak of Derbyshire. This place has been long famed for its warm mineral waters and baths. There are a number of springs of tepid water at this place; of which Dr. Short says the following were the principal when he was there.

1. Two large springs, and several smaller ones, which rose up through chinks in the rock, and seams of the pavement of the principal bath.

2. Thirty-two and a half yards north-east, the springs which supplied St. Anne's well.

3. Twenty yards south-east of St. Anne's well there is another tepid spring, and likewise a cold one, both rising up into the same receptacle.

4. In the same field, sixty-three yards south-east of St. Anne's, was the hot spring which supplied Bingham well.

5. East

5. East of this, four tepid springs of less note.

The principal inn or hotel, at this place, is called the Hall; and behind it is the grand or old bath, now called the Gentleman's Bath, which is supplied with water as mentioned by Dr. Short; and near to it are two other baths, the one for the use of female bathers, and the other for the poor.

Dr. Pearson, who in the year 1784 wrote two volumes of Observations and Experiments, on these waters, mentions, that the Bingham well is now covered with buildings; and that the old St. Anne's well is destroyed, and that a new-covered basin has been erected, and that the water of this well is principally drank by the invalids.

The waters of all the springs at Buxton are quite clear and transparent, and betray no signs of any heterogeneous particles to the taste; and they throw up a number of air bubbles as they rise from their springs.

The heat of the water of the springs which supply the Gentleman's Bath, Dr. Pearson says, raised the quicksilver of Fahrenheit's thermometer to $81\frac{3}{4}$ and 82; and the heat
of

of the water of the new St. Anne's well to 81 and $81\frac{3}{4}$; which agrees with the account of the heat of these waters, mentioned in a letter dated 28th of October 1772, which I had from Dr. Pennington of Cambridge, who had just come from visiting these baths, who says, that the heat of the water of the bath, and of St. Anne's well, both raised the quicksilver of his thermometer to 82; but that the heat of the Bingham well, which was not then covered with buildings, raised it only to 73.

The solid matter got from these waters by evaporation is but small, and should seem to be different at different times and in different seasons. Dr. Short obtained from a gallon of the Bath water, a scruple; two thirds of which were earth, and one third a saline matter composed of sea salt and vitriolated magnesia, or what he calls nitrum calcarium.

Dr. A. Hunter, who published an account of these waters without putting his name to it, says he got 25 grains; of which, 15 gr. were a light blue-coloured earth; and 10 gr. composed of natron and sea salt.

Dr.

Dr. Pearson got only 16 grains, made up of sea salt, felenites, and calcarious earth.

Dr. Higgins (as mentioned by Dr. Pearson) obtained $17\frac{1}{2}\frac{6}{10}$ grains made up of $2\frac{1}{2}$ gr. of calcarious earth, and $\frac{1}{2}\frac{1}{10}$ of iron combined with acidulous gas, $1\frac{1}{4}$ gr. of felenites— $3\frac{1}{2}$ gr. sea salt— $1\frac{1}{4}$ gr. of salited magnesia.

From these accounts it appears, that the Buxton waters contain but very little solid matter, part of which should seem to be suspended by an acidulous gas.

Besides these solid matters and gas, Dr. Pearson says they are replete with a fine permanent vapour, which he has, from a number of experiments, proved to be a compound of air and phlogiston; this vapour manifests itself in the water by the numerous air bubbles which rise from the bottom of the baths and wells, and is seen suspended above the water in the baths; and he alledges, that on the effects of this vapour, and of the simple element water, heated to a certain degree, the virtues of these waters and of their baths principally depend.

These waters and baths are at present in
great

great repute, and have been recommended for the cure of rheumatisms, gout, palsy, diabetes, obstructions in the urinary passages, and in many other complaints.

They have no sensible operation different from that of common water, though they have been alledged to be more diuretic; they are drank by half pints, the length of two, three, or more pints in the day.

There is in the neighbourhood of the baths a chalybeate water, which I before mentioned, that may be used by those for whom it may seem proper. The Buxton waters themselves are slightly impregnated with iron, but with so little as scarce to deserve mentioning. Dr. Short found some particles that were attracted by the loadstone, in some of the earth of these waters, which he calcined; and Dr. Higgins has mentioned, that a gallon of water contains one twentieth part of a grain of iron.

4. *Matlock.*

The baths of Matlock are situated in the county of Derby, ten miles north of the town of Derby, in the road towards Chatfworth.

worth. There are a number of warm springs at this place and in the neighbourhood, which Dr. Short alledges to acquire their heat by the water passing through a bed of limestone, and another sort of stone which he calls croilstone. He says that the water of the bath, and of all the other tepid springs, is exceeding clear, and has no steam except in cold weather; neither does it throw up great bubbles of air as the Buxton water does; and is about a dram in the pint lighter than common water.

Dr. Pennington of Cambridge, in his letter to me, dated Oct. 28, 1772, mentions, that having lately passed through Derbyshire, he tried with a good pocket thermometer the heat of these waters; and that all the warm springs he met with at Matlock raised the quicksilver in his thermometer to 69, though the remotest of them was a mile distant from each other; at the same time the quicksilver stood at 56 in the river Derwent, and at 62 in the shade at noon.

The water, on being mixed with some drops of an infusion of galls, struck a fine
purple

purple colour. Spirit of vitriol dropt into it caused an effervescence, and it became clearer; alkalies made it cloudy and milky.

Evaporated, it yields different quantities of solid matter; on a medium, about 37 or 38 grains from the gallon; of this about 12 or 13 gr. are saline matter composed of sea salt and calcarious nitre (vitriolated magnesia), the rest calcarious earth, which Dr. Short says, after it was calcined, had some particles mixed with it which were attracted by the loadstone.

From this account of the Matlock water, it should seem to be a light chalybeate of a tepid temperature, which contains but a small portion of solid matter.

It has been recommended in most of the diseases for which the Bristol waters have been prescribed; and its baths have been used for gout, rheumatism, and other complaints, where a tepid bath has been found serviceable.

It is drank from one to five or six pints in the day.

S E C T. II.

Of Foreign Warm Mineral Waters.

T H E R E are a great number of warm mineral waters in France, Germany, Italy, Spain, and other countries, impregnated with various mineral substances; in the same manner as the cold waters already mentioned, some of which are particularly described; others but very slightly mentioned. As I have considered most of those in general use, in this part of the world, in the second volume of my Treatise on Mineral Waters, I shall refer those, who wish to be further informed, to that work, and shall only here mention very slightly two or three of those warm waters which are sometimes resorted to by people of this country; which are,

Chaud Fontaine, and *Aix la Chapelle*, both near to Spa; *Barege*, in France; *Pisa*, in Italy; *Caroline Baths*, in Bohemia.

1. *Chaud Fontaine.*

About three leagues from Spa, and two
from

from the city of Liege, are the baths of Chaude Fontaine. The water is tepid, and said to be alkaline and sulphureous; there is an hotel, and about forty baths here for the accommodation of strangers. I have only met with two accounts of these baths, which are both very superficial.

2. *Aix la Chapelle*, Germany,

Is a large imperial city, situated in the duchy of Juliers, on the confines of Flanders, seven leagues from Spa. Here there are a number of springs of hot sulphureous waters, which supply a number of baths. On the vaults above the springs and aqueducts of these waters is found, every year, when they are opened, a quantity of fine white-coloured flowers of sulphur, which has been sublimed from the waters.

The heat of the water of the hottest spring, by Dr. Lucas's account, raises the quicksilver of Fahrenheit's thermometer to 136—by Mons. Monet's account, to 146—and the heat of the fountain, where they commonly drink, by Dr. Lucas's account, to 112.

Dr. Lucas evaporated the water of the hottest spring (of the Emperor's Bath), and obtained 268 grains of solid matter from a gallon, composed of 15 grains of calcarious earth, 10 grains of felenites, and 243 grains of a saline matter made up of natron and sea salt.

By Sir T. Bergman's account, a Swedish kanne contains 27 grains of lime saturated with aerial acid, 29 grains of sea salt, and 70 grains of mineral alkali.

These waters are powerfully diaphoretic and diuretic, and, if taken in quantity, prove purgative.

3. *Barege*, in France.

Barege is situated in the county of Bigorre, in the south-west part of France. At this place there are a number of springs of hot water; and the heat of the hottest spring raises the quicksilver in Fahrenheit's thermometer to 122; of the coolest, to 97.

These waters are clear as they rise from their springs, have a slight smell of hepar sulphuris, and turn silver of a black colour. Evaporated, they contain but a very small
3 quantity

quantity of solid matter. Declos only got 13 grains from the gallon ; and Dr. Rutty 17 grains, composed of sea salt, natron, calcarious earth, and selenites.

These waters are generally believed to contain a fine fossil oil in a volatile state ; and Sir Christopher Meighan says, that they are always perfectly clear and limpid as they rise from their springs, and, if received into a glass, a fine pellucid oil is to be observed on their surface, but that this vanishes in a very short time.

The operation of these waters is principally by perspiration and urine ; they are drank and used as baths, and are famed for the cure of old wounds and ulcers.

4. *Pisa*, in Italy.

In the country of Pisa, situated in the north-west corner of Tuscany, of which it now makes part, are a number of springs of warm mineral waters. About sixteen miles from the town of Pisa is a bath called Bagno a Acqua, which is supplied by the waters of a tepid spring which is much frequented, and people remain for hours in

it. And at the bottom of Mount Pisa, now called St. Julian, twelve miles from the town, are a number of springs of warm water, which is both used for drinking and for bathing in.

These waters have been in repute for some hundred years past; and about forty years ago the grand duke of Tuscany had a number of baths and lodging-houses built for the accommodation of those who frequented the place.

By the accounts of Dr. Cochi and Dr. Bianchi it should appear, that the hottest of the waters here raises Fahrenheit's thermometer to 104, the coolest to 92; they are all extremely clear and transparent as they rise from their springs, so that the minutest objects may be seen at the bottom of the baths: they have no smell or taste different from common water; they were formerly thought to be chalybeate, but on trial they shewed no signs of being impregnated with iron.

Dr. Cochi says, that a pound (12 ounces) of the water of the fountain of Neptune, when evaporated, left 27 grains of solid matter;

matter ; of which three-fourths were earth, the rest salt. From his account, what he calls earth, should seem to be partly calcareous, partly felenites, but by far the greater part felenites ; the salt he says is a mixture of natron and sea salt. By Dr. Bianchi's account, eight pounds of the same water yielded $89\frac{1}{3}$ grains of earth, and $22\frac{2}{3}$ grains of bitter salt.

These waters are diaphoretic and diuretic, and, if drank in large quantity, often operate by stool.

5. *Caroline Baths*, in Bohemia.

In the district of Ellebogen, in the north-west corner of Bohemia, on the confines of Saxony, is Carlsbad, a town built by the emperor Charles IV. which has been long celebrated for its baths and mineral waters, which are of the purgative chalybeate kind. A number of physicians have examined them, and given accounts of them ; Dr. Hoffman, Dr. Berger, Dr. Adolphus, Dr. Springfield, Dr. D. Becher, and others.

Dr. D. Becher, who published an account of these waters in 1765, mentions

five springs which are now used : the furious (or Prudel), the heat of which raises Fahrenheit's thermometer to 165 ; the new spring, to 143 ; the garden spring, to 135 ; the mill spring, to 114 ; the rock spring, to 117.

All these waters are perfectly pellucid at the fountain, but those of the *furious*, the *new*, and the *garden* springs, soon become white, when let stand to cool ; but those of the *mill* and of the *rock* springs, preserve their pellucidity till they are cold.

They should all seem to contain aerial acid, but as this is in a very volatile state, and easily dissipated by heat, the waters of the hottest springs taste the least acidulous. The water of the *furious* spring tastes saltish and lixivial ; of the *new* and *garden* springs, slightly acefcent ; of the *mill* spring, gratefully acefcent ; of the *rock* spring, almost like common water.

All these waters strike a purple on mixing them with some drops of an infusion of galls ; and particles attracted by the loadstone, are found mixed with the solid matter obtained by evaporation.

Both

Both Dr. Hoffman and Dr. Berger evaporated the water of the furious (or Prudel) spring, and got each of them a dram of solid matter from 24 ounces of the water, which is in the proportion of 340 grains from the gallon; but they differ with respect to the matter, of which this residuum is composed. Dr. Hoffman says, that he got only 30 grains of salt, and 18 grains of earth, and that he lost 12 grains in his processes; Dr. Berger, that he had 50 grains of salt, and only 10 grains of a white calcarious earth, which comes near to what Dr. Hoffman got from the water of the mill spring. By Dr. Berger's account, the saline matter should seem to be composed of natron, and Glauber, or Epsom salt, with a small portion of sea salt.

Dr. Hoffman says, that the same quantity of the water of the mill spring yielded a dram of solid matter, the same as the *furious* spring; but that he obtained from this dram 43 grains of pure salt, composed of natron and a neutral salt of the nature of Epsom, and but five grains of earth, and that he lost twelve grains; and he observes, that the water of this spring does not in-

crustate its pipes with an earthy matter, as the *furious* spring does.

Dr. David Becher, who evaporated these waters, by putting retorts filled with them, placed in a proper machine, into the well of the *furious* spring, so that their bottom dipped a little way into the water, alledged that the greater part of it is a true Glauber salt, which is mixed with some crystals of sea salt, and a small portion of fossil alkali ; that the yellow sediment which the waters drop, prove to be of a ferruginous nature ; that the earth is partly of an absorbent or calcareous, which is soluble in acids, partly argillaceous-felenitical, which is not.

Sir Torbern Bergman mentions, that a kanne of the Caroline water contains, of aerated lime 24 grains ; of vitriolated mineral alkali 240 grains ; of sea salt 32 grains ; of mineral alkali 68 grains.

All these waters are purging chalybeates : Dr. Adolphus tells us, that the water of the *mill* spring is much more purgative than that of the *furious*, inasmuch that sixteen glasses full of *mill* water purges freely, when it takes thirty of the other to produce

produce the same effect. And Dr. Springfield alledges, that the water of the *furious* spring is a very powerful Lithontriptic, or dissolver of the stone, and that a number of gravelish complaints have been cured by their use.

These waters and baths have been used for a great variety of complaints, for disorders of the stomach and bowels, female obstructions, scrophula, and for a vast variety of other diseases.

C H A P. V.

S E C T. I.

OF VINOUS LIQUORS AND
ARDENT SPIRITS, THE
PRODUCTS OF FERMENTATION.

FERMENTATION, or that process by which certain substances combined with water produce a fermented liquor, containing ardent spirits or alcohol, has been called the *vinous fermentation*. The continuance of it, to produce an acid or vinegar, has been termed the *acetous fermentation*; and its still further continuance, to produce a volatile alkali, the *putrescent fermentation*.

The proper subjects of the vinous and acetous fermentations are vegetable juices, which contain a saccharine principle; or perhaps we may say, with more propriety, that sugar is the

the only subject of such fermentations; for no substance will ferment, except it contains more or less sugar; and by Mr. Marggraaf's Experiments, related in the Memoirs of the Royal Academy at Berlin, it should appear, that most vegetables contain some; and that, by proper management, most of them may be brought to ferment; though they are not all equally fit for this purpose; nor are the same equally proper at all times.

Some vegetables are proper for fermentation in their natural state; but others require particular management, before they become so; and if they be the solid parts of vegetables, which are to be the subjects of fermentation, they are to be mixed with a sufficient quantity of water, and let stand till it has extracted their saccharine parts; but the natural juices of the grape, or of other fruits, and the sap drawn off from trees, generally require no such addition.

When once the liquor to be fermented is found to be in a proper state, it is to be put into proper vessels, which are to be filled about nine-tenths of their height; then to be slightly covered, and kept in a degree of heat

heat which raises the quicksilver in Fahrenheit's thermometer to between 54 and 64 degrees, without stirring or agitating; when the fermentation will soon begin, and must be allowed to go on till the vinous process is finished; which is known by the liquor sending out no more of those fine vapours, or fumes, formerly called gas sylvestre, but now fixed air; by the hissing or small bubbling noise being no longer heard, on the application of the ear to the vessel; by the clearness of the liquor, and by its pungent, vinous sharpness upon the tongue.

So soon as the vinous fermentation is completed, the further progress of fermentation is to be put a stop to, by shutting up close the cask with the liquor, and putting it into a cool place, and letting it remain there till it has clarified itself, by depositing its lees or dregs; for if we allow the cask to remain in the same degree of heat, and in the same state as when the vinous fermentation was going forward, a fresh fermentation will begin, and the vinous liquor be changed to a vinegar.

In carrying on this process, it ought to be

be observed, that there are several things that check it, which ought to be known; such as cold, acids, alcohol, alkaline salts, absorbent earths, the steams of sulphur, and of charcoal, bitters, oils, animal and vegetable mucilages, resinous substances, the prevention of the access of air, and many other things, of which an account is to be found in Boerhaave's Chymistry, in Shaw's Essays on Universal Chymistry, and in many other books.

From the right management of fermentation are produced the different sorts of wine, of cyder, and of ale and beer; which all have different properties, according to the different substances they are made from; the manner in which they are treated, and in which the fermentation is carried on. They are smoother or rougher, and are weaker or stronger, according to the nature of the vegetable substances employed, their degree of maturity, and the manner in which they are managed; and they are vapid, or brisk, according to the length the fermentation is carried, and so forth.

S E C T. II.

Of the Vinous Liquors in common Use.

SWEET wines are generally strong, and abound with a glutinous matter which prevents their passing off easily by the secretory organs; of this kind are *Malaga*, *Canary*, *Cape*, and other *sweet wines*, which are prescribed by physicians more for strengthening the stomach and increasing the tone of the nerves, than for promoting the secretions; and for the same reasons, *ale*, which abounds with a mucilage, is sometimes ordered as a strengthening medicine, but not for promoting the secretions; though beer, which is a liquor somewhat of the same nature, but more free of ropy mucilaginous particles, owing to the fermentation having been carried further in the preparing of it, is sometimes used for this purpose, or made a vehicle for diuretic medicines.

Madeira, *Sherry*, the wines from the western isles off the coast of Africa, and
many

many other white wines, which are not sweet, but are strong, do not easily ferment; and therefore have always been looked upon as good wines for weak stomachs.

The sharp acescent white wines, such as *Lisbon, Rhenish, Moselle, Old Hock, &c.* are generally thought to promote the secretions, particularly by the kidneys; and therefore are often prescribed with that intention, and have been preferred to other wines in nephritic cases, on that account; and as they have been suspected to be more antiseptic, especially the *Old Hock*, than many other wines, they have been much used in putrid disorders.

Red wines have in general a degree of astringency, by which they brace and strengthen the fibres of the stomach, thicken the fluids, and prove serviceable for restraining immoderate secretions: *Red Port*, and other red wines from the warmer climates, which are made with very ripe grapes, and are mixed with brandy before they reach us, in order to prevent their fermenting, are strong and useful, where a strong red wine is wanted. The *Claret*, and other *Red Bour-*
deaux

deaux wines, are seldom mixed with spirits, and are not so heating as the Burgundy red wines, and therefore are found to be good cordial remedies, proper to be used in low feverish disorders, where wine is wanted.

The virtues of all these wines, and of other vinous liquors, depend in a great measure on the quantity of ardent spirit they contain; which in them is diluted much with water, and intimately united with other principles; by which means its fierceness and heating quality is greatly blunted; for which reasons wines are much more employed for raising the pulse, and supporting the *vis vitæ* in low fevers, and in other diseases, than spirit by itself; and experience has shewn, that they are more friendly to the human constitution than spirits, and that their use may be continued for a considerable time without injuring it, or being attended with those inconveniencies which are concomitant on the habitual use of spirit, though the effects produced by both are in some measure similar; for they both raise the pulse, and, if taken in moderate quantity, cheer the spirits;

spirits; and if taken too freely, *make people drunk, and lose their senses for a time.*

All wines ought to be well fermented before they are used, for if the fermentation has not been carried far enough, they are apt to ferment in the stomach; and if it has been carried too far, there is danger of the acetous fermentation taking place.

S E C T. III.

Of Ardent Spirit.

I HAVE already observed, that the first process of fermentation, called the *vinous*, produces a vinous liquor that contains more or less of an ardent spirit; which may be separated from it by distillation.

By the first distillation, there comes over with the spirit a quantity of water, and of an essential oil of the vegetable substance that was the subject of fermentation, intimately united with it; and it is this oil which gives the particular taste and flavour to malt spirit, brandy, rum, arrack, gin, &c. and

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constitutes the difference between them ; for when the spirit is freed of its water and essential oil, and is rendered perfectly pure, it is the same in all ; and commonly goes by the name of alcohol or pure spirit.

It is brought to the state of alcohol by repeated distillations, performed with a gentle heat, that is capable of raising the spirit free from the water ; and by stopping the distillation as soon as we suspect any of the water to rise.

In cold countries, the spirit has been sometimes rectified, by exposing it to such a degree of cold, as freezes the water, but not the spirit.

Many chymists have recommended, to ultimately rectify the spirit, by mixing with it some pure dry fixed alkaline salt ; believing that the salt would absorb any water which remained, without affecting the spirit : but Monsieur *Malouin*, and other chymists, say, that the spirit is not rectified or made stronger, as is commonly believed, by this mixture, but that it is in some measure decomposed by it.

Alcohol or spirit rendered as pure as possible,

sible, flies all away if exposed to the air; it contains a large quantity of phlogiston, or inflammable matter; but what this matter is, has not as yet been determined, though many conjectures have been made about its nature, and many properties have been attributed to it by chymists: when burnt, it leaves no residuum.

Stahl, Macquer, Vogel, and many other chymists assert, that pure alcohol is not a simple, but a compound body, made up of water, a fine essential oil, and an acid, all intimately combined by fermentation, which has been proved by a number of facts and experiments.

1st. *Geoffroy* and other chymists have got from eight ounces of alcohol, which burnt without leaving a residuum, above four ounces of water; and when alcohol is burnt under a glass bell, such as was formerly used for procuring the vitriolic acid (*oleum sulphuris per campanam*) the inside of the glass is presently wetted with water.

2d. An oil is proved to exist in spirit, by an æther and *oleum dulce* being produced by its mixture with the vitriolic and

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nitrous acids; by the great inflammability of alcohol, and by its readily uniting with essential oils and resins.

3d. And an acid is discovered by the smell of the spirit; by its precipitating sulphur from an alkaline lixivium; and by a neutral salt being obtained from salt of Tartar, which has been used repeated times for rectifying alcohol.

Alcohol, when pure, is the lightest of all fluids, except æther, and some other very subtil oils, got by repeated distillations.

The specific gravity of alcohol to that of water, is, by Mons. Morveau's account, as $857\frac{1}{8}$ to 1000.

It is extremely inflammable, and burns to dryness, affording neither foot nor fœces.

Its properties, with respect to the other classes of bodies, are,

1st. It mixes and unites intimately with the vitriolic, the nitrous, the muriatic, and the acetous acids; and by this mixture the dulcified spirits, æther, &c. may be produced. It dissolves the sal sedativus of Homberg, and the sal succini.

It will not mix with the mild or common
fixed

fixed alkali; but *Monf. Morveau* says, that it dissolves about one-sixteenth part of its own weight of the concrete volatile salt; it unites intimately however with the caustic alkalies, both fixed and volatile.

It joins with the tartarus regeneratus, or *sal vegetabilis acetosus*, and with the nitrous, the muriatic, and the vegetable ammoniacal salts, but not with the vitriolic; and by their assistance, its power as a menstruum is greatly increased.

2d. It dissolves and unites intimately with essential oils and resins, and has been much employed for extracting them from vegetable substances, or for forming tinctures or essences with them.

Pure spirit (alcohol), or spirit with the addition of a small quantity of water, called *rectified spirit*, dissolves almost only the pure resins and essential oils of vegetables, and therefore is employed for forming tinctures with the balsams of Mecca, Tolu, &c. and with the pure resinous substances improperly called gums, such as *benzoin*, *elemi*, *labdanum*, *storax*, &c. and for dissolving *camphor*, the essential oils of plants, viz. of mint, la-

vender, peppermint, &c. and to form with them tinctures, commonly called essences of these plants, which are miscible with watery liquors.

And as spirit dissolves the caustic volatile alkali, as well as the essential oils, chymists have combined them together with spirit, to form sweet-scented volatile essences of various sorts.

Spirit diluted with water, till it comes to the standard of what is called proof spirit, not only dissolves the resinous parts of vegetables, but likewise part of the gummous and saline; and therefore, it has been employed in this state, to form most of the spirituous tinctures used in practice.

Spirit does not affect the other oils, unless they have been rectified by repeated distillations; and the oftener they are distilled, they are the more easily mixed with the spirit, which is contrary to what happens to the essential oils, for the oftener they are distilled, it is the more difficult to mix them with spirit. *Macquer* thinks, that the reason of this phenomenon is, that the mixture of oil and spirit depends on an acid; that the

4

expressed

expressed and animal oils abound with a mucus and other principles, which involve the acid, and prevent its exerting itself, till the oils are purified from the viscid particles by repeated distillations, and the acid is set at liberty ; and that the essential oils, on the contrary, have a superabundance of acid, which is in part separated by their being rectified ; and that therefore, the oftener they are distilled, the more they lose of their acid, and become more difficult of mixture with spirit.

Spirit does not affect sulphur by itself, but dissolves it after it has been combined with an alkali ; and it dissolves soap and saponaceous bodies.

3d. It dissolves the corrosive sublimate mercury, and the regulus of antimony which has been previously united with an alkaline salt.

4th. It does not act upon earths.

5th. It unites with water, and generates a degree of heat on mixture ; and as it has a greater degree of affinity with water than with other bodies, it precipitates them from it. It likewise precipitates iron, bismuth, and mercury from aqua fortis ; the

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two first in part, the other wholly ; *regulus of antimony* from spirit of salt; and *quick-lime* from spirit of nitre.

Ardent spirit prevents the fermentation of vegetable and of animal substances; is a strong antiseptic, and contracts or draws together the fibres of animal bodies, and hardens the solid parts, and coagulates most of the animal fluids.

It has sometimes been employed with advantage for stopping hæmorrhages, by applying it to the parts from which the blood flows; but it has often done mischief, by bringing on pain and inflammation. When diluted to the state of proof spirit, it is frequently applied to parts which have been just scalded or burnt, without the skin being broken, in order to allay pain, and prevent inflammation; and it is often mixed with fomentations used for bathing parts which have been sprained, or which have been weakened or too much relaxed.

Pure spirit is too strong and fiery to be taken down into the stomach, till it has been diluted with two, three, four, or more times its own weight of water. When
swallowed,

swallowed, it produces the same effects on the stomach as when externally applied; it gives a brisk stimulus, contracts and draws together the fibres, prevents fermentation, resists putrefaction, and corrects any putrid acrimony that may be lodged in the stomach. When taken up by the lacteal and lymphatic veins, and mixed with the blood, it thickens it, and stimulates and irritates the heart and blood-vessels, and thereby increases the quickness of the pulse, and the heat and momentum of the blood; and if taken in sufficient quantity, it affects the brain and nerves in a particular manner, causing intoxication; if taken in still greater quantity, it deprives people of their senses and of the power of motion for a time, and even sometimes acts like a poison, and causes immediate death; and indeed spirits generally act as slow poisons with those who habituate themselves to their use; for after some time, people contract such a craving after them, that they cannot want them, and become habitual drunkards; the effect of which is, that the spirit gradually and insensibly contracts and hardens their fibres, affects the brain
and

and nerves, impairs the understanding, brings on tremors, occasions obstructions of the viscera, dropsies, and the whole train of chronic disorders, insomuch, that it has been a doubt with many, whether spirits have not made as great havock amongst mankind as gun-powder, or the sword.

However, brandy or rum, or other spirituous liquors, if properly used, become useful remedies on particular occasions; and have been employed with advantage to people likely to fall into fainting fits, or who are so low, that other cordials have no effect upon them; and when properly diluted, and given in small quantities, and with caution, they have been found to be of use in many diseases, for supporting the vis vitæ, and raising the pulse.

In low fevers, and in cases where the vis vitæ wanted support, we were frequently obliged to use spirits diluted with six or seven times their own quantity of water, in the military hospitals, in place of wine, and have found it to answer well. I have seen some practitioners use proof spirits freely in fevers; but in general it did hurt, and
many

many were precipitated to their graves by these means.

With regard to the use of spirits, it ought to be observed, that so soon as the necessity of using them is over, they ought to be laid aside, to prevent the patients becoming habituated to them, and thus becoming habitual drunkards.

C H A P VI.

OF MEDICINES PREPARED FROM THE MIXTURE OF SPIRIT, OR ALCOHOL, WITH THE DIFFERENT ACIDS.

IN speaking of the general properties of alcohol or pure spirit, I remarked that a *dulcified spirit, an æther, &c.* may be procured by its mixture with different acids; I shall therefore next consider them, and begin with those prepared from the vitriolic acid.

S E C T.

S E C T. I.

Of the dulcified Spirit; Æther, and Oleum Dulce, procured by the Mixture of Spirit with the Vitriolic Acid.

1. Of the dulcified Spirit of Vitriol.

THIS spirit is made in the following manner; take two pounds weight of pure spirit (or alcohol), put it into a long-necked matrafs, and add to it by little and little at a time, *one pound weight of pure vitriolic acid*; taking care that the first quantity be incorporated before another quantity be put in; by which means the heat which ensues on their mixture will be inconsiderable; and the acid and spirit will be incorporated without any inconvenience; then stop the matrafs well, and let it stand for nine or ten days, shaking it gently two or three times during that time, at the end of which period, the acid and spirit will be fully incorporated, and the liquor will have acquired a brown colour.

Then

Then pour the liquor into a proper glass retort by means of a long glass tube or funnel; put the retort with the liquor in a sand furnace, and lute to it a receiver, either with or without an intervening adopter; and if the receiver be a tubulated one, it will be the more convenient.

When the apparatus is all fixed, light the fire, and distil with a very regular, flow, and gentle heat. At first, there will come over a small quantity of alcohol little changed, and after it the *dulcified spirit* which contains the æther. Continue the distillation till a white sulphureous vapour begins to rise; and then immediately remove the vessel containing the dulcified spirit. If a tubulated receiver has been used, remove the glass vessel which has been luted to the tube of the receiver, and contains the distilled liquor, and lute on another in its place. But if the receiver has not been a tubulated one, it must be removed with its contents, and a fresh one luted to the receiver, and the *dulcified spirit* put into a well-stopt glass vessel.

2. *Dulcified Oil of Vitriol.*

When once the vessel containing the dulcified spirit of vitriol has been removed, and another fixed in its place, the fire is to be renewed, and the distillation carried on as before. At first there will come over a fragrant and sulphureous phlegm, and, soon after, with it an oil called the *sweet oil of vitriol*, and likewise *naphtha vitrioli*, and *oleum vini*. It is first observed in the upper part of the neck of the retort in drops, in form of a sebaceous matter, and then it comes over into the receiver; part of it sinks to the bottom of the acid phlegm, and part of it swims on the top of it. During this operation, the greatest care ought to be taken not to increase the heat too much, otherwise the black matter in the bottom of the retort will rise, and get over into the receiver, and frustrate the operation; and if ever this matter is observed to rise or swell, and be in danger of coming over, the receiver with the *oleum dulce* ought to be removed; the fire put out, and the retort raised in the sand to diminish the heat.

After

After this operation is finished, the *sweet oil* (or *oleum vini*) ought to be carefully separated from the acid phlegm, and kept in well-stopt vessels.

The materials left, after the *oleum dulce* is drawn off, are still capable of yielding more, if fresh spirit (alcohol) be poured over them, and the distillation be repeated as before.

Dr. Hoffman got six drams of this *oleum dulce* by the first distillation, from a pound of the pure vitriolic acid, mixed with six pounds of spirit; but Dr. Vogel says (*Inst. Chemiæ*, sect. 489, &c.), that by repeatedly adding fresh spirit, and distilling again from the residuum, and afterwards by the assistance of alkaline salts, and water, some had got three ounces, others four, and others above six ounces of this *sweet oil*, from the same quantity of materials.

In preparing these medicines, the *dulcified spirit*, and *oleum dulce*, chymists have varied the manner of performing the processes; and they have used different quantities of spirit, in proportion to the quantity of acid. Some have taken equal parts of alcohol and acid;
others

others from two to six parts of spirit to one of acid ; but though these variations may make a little difference in the quantity of the liquors produced, yet it makes no difference in their virtues and properties, when reduced to a state of purity.

3. *Vitriolic Æther.*

I have already observed, that the dulcified spirit contains the æther ; if two pounds of it be put into a retort ; and a receiver be luted to it, and one half be distilled off with a very slow and gentle heat, this product will be æther.

Some chymists, in performing this process, put an ounce or two of alkaline salt into the retort, with an intention of absorbing superfluous acid ; but others think this precaution unnecessary ; and some recommend to put the æther into distilled water after it is drawn off, in order that the water may take up whatever portion of spirit has arisen with it ; the æther itself, being immiscible with the water, will rise to the surface, and may be separated from it with ease.

Hoffman's

Hoffman's anodyne Liquor.

This medicine, which has been much used for a number of years in most countries of Europe, Dr. Vogel says, is made by mixing about twenty-four drops of the *oleum dulce* with four ounces of the dulcified spirit of vitriol.

The same author tells us (Inst. Chem. sect. 482.) that if only an anodyne liquor is wanted, it may be got in the greatest perfection, by mixing a liquor composed of three or four parts of pure spirit, and one of the vitriolic acid, with about half the quantity of white, very dry potter's earth, and distilling from a very large retort; when the anodyne liquor will come over from the beginning to the end, without any heavy smell, or any acid phlegm or oil following, or the residuum rising into bubbles.

From what has been said, it should appear that the *dulcified spirit*, the *æther*, and *Hoffman's anodyne liquor*, were nearly of the same nature; and that the difference between them consisted, in a great measure,

in the different proportional quantity of *oleum dulce*, which each of them contained.

Chymists have been much divided in their opinions about the nature of this *oleum dulce*; whether it be the pure essential oil of the spirit, which is separated from it by the concentrated acid laying hold of the watery and other parts which enveloped it, and prevented its shewing itself; or whether it be a new compound, formed of the fine essential oil of the spirit, and the fine subtile parts of the acid. The generality of chymists at present embrace the first opinion; but some few the latter, amongst whom is Dr. Vogel, who says (*Inst. Chemiæ*, sect. 485, 486), that his opinion is supported by the following facts: 1st. It effervesces with *oleum tartari per deliquium*, and produces a neutral salt of the nature of *tartarus vitriolatus*. 2. If distilled with water, it gives the water an acid taste; and the oftener the distillation is repeated, the more acid the water becomes, and the more the quantity of *oleum dulce* is diminished. 3. If it be distilled with *aqua calcis*, there come over only sixteen grains of a very fragrant oil from half an ounce

ounce of the oleum dulce; and what remains is partly a very sharp oil of vitriol, and the rest of it a pultaceous matter resembling cotton.

The black mass, which remains in the retort after the first distillation of oleum dulce, is of a resinous nature, and, if burnt, emits a sulphureous smell; it is soluble in spirit, in the anodyne liquor, in æther, and tinges these liquors of a red colour; if washed and dried, and afterwards distilled, it yields an oil not differing from that obtained from fossil bitumens; and, with salt of tartar, it forms a hepar sulphuris.

The dulcified spirit of vitriol is limpid, volatile, and inflammable, has a fragrant smell, and somewhat of an aromatic taste; and, if properly prepared, is neither acid nor alkaline, shewing no signs of effervescence on the mixture of either acid or alkaline salts.

It dissolves essential oils and resins, and extracts elegant tinctures from many vegetables.

It is a fragrant, aromatic, and cordial liquor, which gives a brisk stimulus to the

fibres, and increases the tone of the nerves; and it quenches thirst.

It is generally esteemed to be a powerful remedy for allaying spasms, and has been much used in nervous, in hystERIC, and in flatulent disorders with this intention; it has been believed by many persons to ease pain, and to procure rest in feverish disorders.

It is antiseptic, and corrects putrid acrimony lodged in the stomach and bowels; and, when taken up by the lacteal and lymphatic veins, it assists in correcting the putrid tendency of the blood, and therefore has been often prescribed in putrid disorders.

It increases the watery secretions by the kidneys, and by the skin; by the assistance of warm, mild liquors, it promotes perspiration and sweat, particularly if opiates be joined to it; and it passes off by urine, if assisted by repeated small draughts of tepid or cold mild liquors.

It has been given from half a scruple to two drams, or more, for a dose.

There is in the Pharmacopœia an elixir vitrioli dulce, made of this dulcified spirit
and

and the aromatic tincture, which partakes of many of the virtues of this spirit, joined to others it receives from the resinous parts of the aromatics.

The *oleum dulce vitrioli* has a very fragrant smell, and may be ranked among the essential oils; it flames easily when a candle is brought near it, even swimming upon water, and is entirely dissolved by rectified spirits; when thrown into cold water, it emits a strong fragrant smell; and when thrown into warm water, it makes a considerable noise. If kept even in the best stopp'd bottles, it loses its fragrant smell and limpid colour; and if the bottles be not full, part of it concretes into a camphorous-like substance, and adheres to the sides of the phial. It dissolves many resinous substances, and even phosphorus by being digested long in it. It impresses a sense of a considerable degree of cold, if applied either to the tongue or to the skin.

Hitherto it has seldom been prescribed as a medicine by itself, though it has been much used when joined with the dulcified

spirit, and has then been called Hoffman's Anodyne Liquor.

Hoffman's anodyne liquor, made, as I just now mentioned, by mixing 24 drops, or a scruple of the *oleum dulce*, with four ounces of the dulcified spirit, possesses the same virtues as the dulcified spirit, but in a higher degree; being more impregnated with the *oleum dulce* than it. Hoffman says of it, that it is sedative and anodyne; is extremely useful in all pains and spasms, and that it may be given in fevers to procure rest, where it would not be safe to give laudanum.

Vitriolic æther, prepared from the dulcified spirit, comes very near, in its properties and medical virtues, to the *oleum dulce*; and it has not hitherto been clearly ascertained in what the difference consists, many chymists confounding the one with the other: *Vogel* seems to think, that the æther is more subtile; and he says, that it sends out no air bubbles, when put under the receiver of an air pump.

Æther is the lightest, most volatile and inflammable of all known liquids. Its specific

cific gravity is to that of pure spirit (alcohol) as 875 to 1000; and if some of it be thrown into the air, it is immediately converted into an invisible vapour; it is remarkably inflammable, and catches fire at a considerable distance from a flaming body, owing to its great volatility and its vapour flying about.

It dissolves all oils, balsams, resins, and oily matters, and is found to be a menstruum for dissolving the elastic gum.

It has a greater affinity with gold than aqua regia, insomuch that, if some of it be poured into a glass containing a solution of gold in aqua regia, it separates the gold from it, and attracts it to the surface.

It does not mix with water, nor with alkaline salts or acids, nor is it decomposed by them.

It was for a long time looked upon as a matter of curiosity, but of late years it has been employed for medical purposes.

Poured on the hand, or any other part of the body, it immediately evaporates, and gives the sensation of a considerable degree of cold; and, if tasted, impresses the same

cold feeling on the mouth. Monf. Baumé wrapt the ball of a thermometer in a piece of linen wetted with æther, and the cold generated by the evaporation sunk the thermometer 17 degrees in the open air, and 41 in vacuo. He next wrapt a glass full of water in a rag wetted with æther; and when it was dry, he wetted it a second time, and in seven or eight minutes the water froze.

Dr. Morris, in the 2d vol. of *Medical Observations and Inquiries*, says, that if it be agitated in a phial with the white of an egg, with lymph, or with the human blood, it does not coagulate, but rather seems to attenuate them.

Externally applied, it has been much recommended for the cure of chronic and of nervous head-aches: I have often seen it used for this purpose; sometimes it was of service, but it often failed. Dr. Morris says, that he has seen the tooth-ache relieved by pouring a tea-spoonful of it on the affected jaw, and confining it with the hand; and repeating it till the pain ceased, which it generally did on the second application; that he had applied it with success externally, in pains of the ear; that one rheumatic case, of
a pain

a pain in the neck, was cured, and another was relieved by the same means.

It has likewise been much used as an internal remedy in nervous, spasmodic, and hysteric cases; in the whooping-cough, in the nervous asthma, in the epilepsy, and in most spasmodic disorders; in cramps of the stomach and flatulencies of the intestines, where there was no acute inflammation or violent degree of fever.

Dr. Morris says, that it may be given with great safety in large quantities. It has been administered in doses from a few drops to two drams, or more.

Dr. Morveau, in the 3d volume of his *Elements de Chymie*, p. 320, alledges, that æther dissolves bilious calculi; and that he had cured two people labouring under the jaundice, from the ducts being obstructed with these concretions, by means of it: In order to render the æther more fixed, he mixed it with equal parts of the essential oil of turpentine, and gave a coffee-spoonful of this mixture every morning; which he thinks had an effect in dissolving and lessening the size of the biliary concretions, so as to enable

them to pass the ducts. He says, the medicine is extremely nauseous, but may be rendered more agreeable by using some other essential oil in room of the turpentine.

S E C T. II.

The dulcified Spirit of Nitre and nitrous Æther.

1. *Dulcified Spirit of Nitre.*

A DULCIFIED spirit is prepared from the nitrous acid with spirit, in the same manner as from the vitriolic.

Put four parts of *pure spirit* into a large long-necked matrafs (or bolt-head) placed under a chimney; and, by means of a glass funnel, add to it, in very small quantities at a time, one part of *nitrous acid*, shaking the vessel as soon as the effervescence, ensuing upon each addition, ceases, before a fresh quantity is put in; by which means the glass will heat equally, and be prevented from breaking. When all the acid has been added, and the effervescence is over,
cork

cork the bottle slightly, and let the matrafs with the liquor stand for a day, to allow the spirit to incorporate with the acid; then, after shaking it gently, pour the liquor, by means of a glass funnel, into a large glass retort; which having placed in sand, and luted to it a large glass tubulated receiver, either with or without an intervening adapter, distil with a very gentle heat, so long as the liquor which comes over does not effervesce with the common, mild, vegetable alkali.

Dr. *Lewis*, in his New Dispensatory, recommends this operation to be performed by means of a water bath; and says, when we use it, we may draw off all that will come over; for this heat will elevate no more of the acid, than what is dulcified by the vinous spirit. How far the water bath may have an advantage over the sand heat, I know not; but hitherto it has not been adopted for general use, though it should seem to be the best adapted for the purpose.

The dulcified spirit of nitre has many of the same properties and virtues as the vitriolic. It is antiseptic, quenches thirst, is anodyne

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anodyne and antispasmodic, and promotes the watery excretions, particularly by the kidneys and skin. Dr. Lewis says, that if it be mixed with any of the volatile alkaline salts or spirits, it proves a mild yet efficacious diaphoretic, and often notably diuretic.

The dose is from half a scruple to two drams.

A small portion of this dulcified spirit gives malt spirits the flavour of brandy.

2. *Nitrous Æther.*

An æther is likewise got from the mixture of the nitrous acid with pure spirit; either,

1st. By simply mixing and digesting them together; and separating the æther with a syphon; or,

2d. By mixing and digesting them together, and then distilling off the æther with a gentle heat; or,

3d. By first mixing spirit and the vitriolic acid in a proper retort, and then adding to this mixture nitre in powder, and allowing

lowing the nitrous æther to distil spontaneously into proper vessels fit to receive it.

It is prepared, in the methods here mentioned, in the following manner :

1st. In the year 1742, Mons. Navier published, in the Memoirs of the Academy of Sciences at Paris, the method of preparing this æther, which before that time was not known. He orders equal parts of pure spirit and of pure nitrous acid to be mixed together in a very large long-necked glass vessel, with the cautions mentioned for mixing these liquors for the preparation of the dulcified spirit ; after all the effervescence is over, stop the vessel well, and let it stand without moving it for nine days ; at the end of which period the æther will be found swimming on the top of the liquor, and may be separated with a syphon. Mr. Navier mentions particularly, that the vessel must be very large ; for he says, it is necessary to stop it very close ; and if the vessel be too small, the force of the vapour is in danger of bursting it.

In order to avoid this inconvenience of bursting the vessels, chymists have ordered
this

this process to be performed in the following manner: Take equal parts of pure spirit, and of pure nitrous acid, in separate large bottles, and dilute each of them with an equal quantity of distilled water; when the effervescence is over, pour the diluted spirit very gently, and by little at a time, down the sides of the vessel containing the acid. The two liquors will remain separate for a time; but a cloud will form where they meet, and bubbles will begin to rise. Cork the vessel very tight, and tie a piece of bladder over it, and let it stand without moving it. A great quantity of bubbles will then be seen continually arising, and depositing a liquor that swims on the surface, and is the æther, which, after nine or ten days, when no more bubbles arise, must be separated with a syphon, or by means of a separating glass.

Dr. Black is said, in the late edition of Lewis's New Dispensatory, published at Edinburgh, to prepare this æther by putting two ounces of the pure nitrous acid into a glass bottle, and adding to it slowly and gradually an equal quantity of water, which he makes trickle down the sides of the vessel,

so as to float on the surface of the acid, without mixing with it; he then adds, in the same cautious manner, three ounces of highly-rectified spirits of wine, which in its turn floats on the surface of the water. By these means the three fluids are kept separate, on account of their different specific gravities, and the water is interposed between the acid and the spirit. The bottle is then put in a cool place, when the acid gradually ascends, and the spirit descends through the water, this last acting as a boundary to restrain their violent action on each other. By this method a quantity of nitrous æther is formed, without the danger of producing elastic vapours or explosion.

2. Dr. Vogel (§ 497.) who approves of using the pure acid and pure spirit as recommended by Mons. Navier, says that the æther, when formed, may be separated either by means of a syphon, or that it may be distilled off with a gentle heat; and he observes, that if it be drawn off by distillation, that the æther will come over first, then the dulcified spirit, and after it the acid phlegm; which is in an inverse order from that in which the products

ducts come over, in distilling the vitriolic acid with spirit.

Several methods have been of late proposed, of distilling this æther, some by means of a diluted, and others of a concentrated acid; but whether they be better than those here mentioned, I shall not take upon me to determine.

3. Of late Mr. Woulf has procured this æther by using the salt of nitre instead of the pure nitrous acid, and by adding vitriolic acid to the alcohol (or spirit) before mixing it with the salt; the effect of which is, that the vitriolic acid, which has been mixed with the spirit, immediately on being poured on the salt, quits the spirit, and lays hold of the alkaline basis of the nitre; by which means both the nitrous acid and the pure spirit are set at liberty, unite, and come over in form of æther into the vessels placed to receive them.

His method of performing this operation is as follows: He mixes with proper care three pounds weight and a quarter of pure spirit, with four pounds weight of pure vitriolic acid, in a large glass vessel, and sets them

them by, till wanted ; he then puts four pounds weight of purified nitre, reduced to powder, into a very large retort, which has a tube coming out from the upper part of its neck, near its body. Having placed this retort in a sand bath without fire, he lutes to it an adopter ; and to the adopter he lutes a large tubulated receiver, the tube of which goes off from the opposite side near the top ; and to this tube he lutes another tubulated receiver with the tube, which is small, going off from near the top of the opposite side ; into this last receiver he puts some spirit, and corks very slightly the tube going out from it, so as to remove it at pleasure to allow air or vapour to pass.

When all this apparatus is fixed, he pours the mixture of the vitriolic acid and spirit, by small quantities at a time, upon the nitre in the retort, through the tube in the upper part of the neck, by means of a long tube or syphon ; and when it is all poured in, he stops the end of the tube. So soon as the vitriolic acid, with the spirit, touches the nitre, a great heat is generated, and fumes begin to arise, and continue rising till all the

æther comes over without the assistance of fire; the greater part of it condenses in the first receiver, and a small portion goes over into the second, where it mixes with the spirit, and forms an anodyne liquor. Dr. Pearson told me, that this operation is completed in a day, and that he had obtained about ten ounces of æther from the quantities of materials above mentioned.

The *nitrous* æther is generally thought to be of the same nature as the vitriolic, and has been used for the same purposes; sufficient experiments not having been made to determine what is the difference betwixt them.

If æther is only the fine essential *oil of spirit* (or alcohol) separated by the concentrated acids attracting the watery and acid parts of the spirit, then there is but little difference between æther obtained by means of the different acids; but if æther is a compound liquor, made up of the fine essential oil of the spirit and the subtile parts of the acid employed, it is probable that, on future trials, the æthers got by means of the different acids

cids will be found to differ from one another considerably.

S E C T. III.

Muriatic or Marine Æther.

IT is a long time since it has been suspected, that a dulcified spirit and æther could be obtained by a mixture of spirit with the marine acid; but no certain method of procuring it was discovered, till within these few years, that chemistry has been so much cultivated.

Mons. *Baume* was the first who accomplished this process, by uniting the vapour of the spirit with that of the marine acid.

Since then, the *Marquis de Courtenvaux* has procured this æther by mixing, in a retort placed in a sand heat, a pint of alcohol with three pounds of a solution of tin in aqua regia, made with two parts of the nitrous acid and one of the marine; and luting to the retort a tubulated receiver, and to that a bottle to receive the distilled liquor; then by distilling with a gentle

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heat,

heat, there came over a liquor composed of a small quantity of spirit, a marine æther, and an acid liquor which has a quantity of tin dissolved in it. The liquor, thus distilled, was then put into a retort containing some of the vegetable alkali, which had run per deliquium ; immediately on mixture an effervescence ensued, and the tin was precipitated : after which, a receiver having been luted to the retort, about half the quantity of the liquor was drawn off, and was found to be a pure marine æther.

The baron Borne, in the 6th volume of the *Memoires Physiques & Mathematiques*, mentions the following method in which he got a muriatic æther : He took twelve pounds of the muriatic acid, and dissolved zinc in it till it was completely saturated ; and then filtered the liquor, put it into a large retort, and evaporated it till it was reduced to one fourth of its original quantity, and allowed it to cool, when it appeared like fat ; he then added to it by degrees six pounds of pure spirit (alcohol), and digested them together for eight days ; during which time
the

the whole of the solution of the zinc was dissolved in the spirit, except a small quantity of a powder which he imagined to be either a luna cornea or luna plumbi. He then again filtered the liquor, put it into a large retort, luted to it a large tubulated receiver, and fixed to the tube, coming from it, another receiver or bottle, and gradually increased the heat in the furnace till the liquor boiled: and he continued the distillation till about one half of the spirit had come over. As soon as stræ began to appear in the middle of the neck of the retort, which shewed that the æther was beginning to rise, he changed the bottle fixed to the tube of the receiver, and then went on distilling with a very gentle heat till the æther had all come over, and there remained nothing in the retort but a dry mass. If the distillation was continued after this, and the heat increased, there came over a fine yellow *oleum dulce*, which swam on the surface of the æther, and was easily separated from it with a syphon or with a funnel; the æther he rectified by distilling it again, with the gentlest lamp heat.

Mr. *Morveau* observes, that if the spirit of wine, which came over before the æther in the first distillation, be poured on the mass which remains, and then again distilled, that more æther and more oleum dulce may be got.

The Baron *Borme* says that this muriatic æther is more penetrating and odoriferous, and more miscible with water, than the vitriolic æther, and he believed it to be true *essential oil of wine*, as much depurated as it is possible to make it by art; and he says that it precipitates silver from the nitrous acid into a luna cornea.

Acetous Æther.

By experiments lately made, it has been discovered, that an æther can likewise be prepared by uniting the acetous acid with spirit, and that it is probable that an æther may be obtained by the mixture of most acids which can be reduced to a certain degree of strength.

Count *de Lauraguais* was the first person who published an account of the method of preparing

preparing this æther, in the following manner :

Put two pounds of pure spirit (alcohol) into a large retort, and add to it by degrees an equal quantity of concentrated acetous acid, shaking the retort a little, from time to time, as the acid is added. When the heat occasioned by the mixture is over, place it in a sand heat, and lute to it a tubulated receiver, and fix to the tube a proper bottle, then raise the heat till the liquor boils.—First a vinous spirit comes over, then the æther, and after it an acid liquor ; and there remains in the retort a small quantity of a brown residuum resembling a resin. The æther, which swims on the surface of the spirit and acid liquor, is to be separated by a syphon or a glass funnel, and it afterwards may be rectified as the other æthers.

The acetous, though it seems to have all the properties of the other æthers, and to contain no more acid, yet it has always a smell of vinegar, and mixes more easily with water than they do.

C H A P. VII,
O F S U L P H U R.

SULPHUR is a yellow substance composed of the vitriolic acid and a phlogiston, which is fusible by heat, and burns with a blue flame when thrown into the fire. It is either found native, or prepared by art.

It is mixed with the ores of all metals, excepting those of gold and zinc; and it is found intimately united with various fossil matters, as in the pyrites and other stones, from which it is separated by sublimation, fusion, and other processes. At other times it is met with completely formed in the bowels of the earth, or lying on its surface, near to Mount Vesuvius, Mount *Ætna*, Mount Hecla, and other places where there are volcanoes or subterraneous fire.

Mr. Tournefort, in the first volume of his *Voyages*, mentions that the sulphur in the island of Milos is pure and perfectly beautiful,

ful, has a greenish shining appearance, which made the ancients prefer it to that of Italy; and is met with in large pieces in digging the earth, nay sometimes in thick veins in millstone quarries: in short, it is found in various forms, and variously combined, in every country; and the purest, which has been found native is that collected from the sides and upper parts of springs or conduits, through which certain hot sulphureous waters pass.

The sulphur that is commonly made use of, is either separated from the yellow pyrites, which is its proper ore, or it is prepared by art.

I have mentioned, that sulphur is made up of the vitriolic acid and phlogiston; this is proved by being able to make a genuine sulphur by an artificial union of these two substances. Thus if equal parts of Glauber salt (or of vitriolated tartar) and of salt of tartar, and one eighth part of charcoal, be triturated together in a mortar, and then thrown into a red-hot crucible, and a cover be put over it, and it be kept there till a blue flame and a smell of sulphur arises, and then it be removed

removed from the fire, and its contents be thrown into boiling water, the greater part of them will be dissolved; and if the water be then filtered through paper, and some of any of the acids be thrown into it, a light-coloured greyish powder will immediately be precipitated, which on being separated will prove to be a true sulphur. In this process, we first mix all the ingredients fit for forming a *hepar sulphuris*, and then we unite them together by subjecting them to the action of the fire. The alkali is here added only because it makes the operation more easily performed; it renders the whole fusible and easy to be united, at the same time that it makes the whole soluble in water; so that any gross or heterogeneous particles which may be mixed, may be separated by filtering the water through paper; and on the addition of an acid, which attaches itself to the alkali, the sulphur precipitates pure and free of any heterogeneous mixture. A sulphur is equally formed by uniting the vitriolic acid with any animal or vegetable oil, or other substance containing phlogiston, by distillation.

A great

A great deal of the sulphur brought from Saxony is made by laying certain minerals, which contain a large quantity of the vitriolic acid, alternately in layers with wood, which they set fire to; by which means the phlogiston of the wood is united with the vitriolic acid; at the same time that the ashes of the wood furnish an alkaline salt, to form a hepar sulphuris, from which a great quantity of sulphur is prepared.

It was formerly believed that the quantity of phlogiston in sulphur was very small in proportion to that of the acid; *Neumann* and *Cartheuser* had both alledged, that fifteen ounces and six drams of acid could be obtained from sixteen ounces of sulphur; but Mr. Kirwan, in the 72d volume of the Philosophical Transactions, has made it appear that they were mistaken, and that a hundred grains of sulphur contains forty grains $\frac{61}{100}$ of phlogiston, and fifty-nine grains $\frac{39}{100}$ of acid.

Sulphur melts with heat, and flames in the open fire. Dr. Alston, in his *Materia Medica*, Vol. I. p. 212, says, that it flames with a smaller degree of heat than will
kindle

kindle any oil, or even spirit of wine, in the free air; but that in close vessels no heat can burn it, or separate its principles; and however often sublimed, it is the same sulphur still.

It loses its fusibility and inflammability by being digested in the vitriolic acid; but it is not affected by the other acids.

It unites with both the fixt alkaline salts, and forms with them a reddish mass called *hepar sulphuris*; which is soluble in water, and runs *per deliquium* in the open air; whereas before this mixture, water had no effect upon it.

In preparing the *hepar sulphuris*, authors generally direct to use equal parts of alkaline salts and of *hepar sulphuris*; but on repeated trials being made at Apothecaries Hall, in the year 1787, it was found that it required five times the quantity of alkaline salt to that of sulphur, to render the whole soluble in water.

If the volatile alkali be triturated with flowers of sulphur, and distilled, they form a kind of *hepar sulphuris*.

When sulphur is combined with any of
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the alkaline salts and dissolved in water, or any other liquor, if an acid is added, it immediately unites with the alkali, and the sulphur is precipitated, owing to its having a greater affinity to the alkali than to the sulphur.

Ardent spirits have no effect upon pure sulphur; but when once the sulphur is united to an alkaline salt, and forms a hepar, it then dissolves it readily.

It is easily dissolved in all oils, and with them forms a kind of balsam, which got different names according to the oils which have been made use of; when made with olive oil, it has been called simply *balsam of sulphur*; when with turpentine, *balsamum sulphuris terebenthinatum*; when with petroleum Barbadiense, *balsamum sulphuris Barbadiense*, and so forth.

When it is united to oil of turpentine, Dr. Stahl says, it may be separated from it by means of spirit of wine in form of saline crystals, called by the name of ruby of sulphur.

It may be combined by proper management with all metals, except gold and zinc.

It

It is not affected by earths in their natural state, though it is often mixed with them; but when the calcarious earths are reduced to the state of quicklime by the force of fire, it then may be united with them into a kind of hepar sulphuris; and quicklime, assisted by heat, renders it soluble in water.

In the late edition of the London Pharmacopœia, the *fulphur præcipitatum* was ordered to be prepared, by boiling flowers of sulphur with thrice their weight of quicklime in water, till the sulphur was dissolved; and then after filtering the solution through paper, the sulphur was precipitated by adding weak spirit of vitriol to it, till the whole of the sulphur was separated, and then it was ordered to be washed, till it was quite insipid. The sulphur precipitated in this manner is certainly whiter and more beautiful to the eye, than that obtained when the sulphur has been dissolved in an alkaline salt; but then it is mixed with a quantity of insoluble selenite formed by the vitriolic acid, and the calcarious earth of the lime water in which the sulphur was dissolved; and for that reason the College have in their
new

new edition of their Pharmacopœia, ordered the sulphur to be precipitated from a solution of sulphur made by means of an alkaline salt, by which means it is obtained pure and free of all foreign mixture. If in performing this process, the water from which the sulphur has been precipitated be again filtered through paper, and evaporated, a neutral salt, formed of the alkali used for dissolving the sulphur, and of the acid employed for precipitating it, will be obtained; whether this neutral salt will contain any sulphureous particles, so as to form a kind of sal polychrest, I cannot say, having never tried the experiment.

Sulphur is not affected with pure water, but may be rendered miscible with it by means of alkaline salts, and of quicklime; Sir Torbern Bergman alledges, that it is dissolved in mineral waters by the matter of heat and phlogiston, and Dr. Dejean, by fixed air; and if Dr. Vandellius found in the conduits of the baths at Aponum, a true crystallized sulphur, which was soluble in water, it shews that there are other means
of

of sulphur being rendered soluble in water, than what have hitherto been explained.

Dr. Macbride, in his *Experimental Essays*, mentions, that if sulphur be dissolved by boiling it in water with three times its own weight of quicklime, and the solution be filtered, and then air (aerial acid) separated from an effervescing mixture be transferred into it, so as to make the lime precipitate by saturating it with air, and reducing it back to the state of a mild calcarious earth, the solution will then appear like a yellowish fluid; which is evidently an equable and true solution of sulphur, now left perfectly alone, and upon being sufficiently diluted, by the addition of more water, constitutes a true artificial sulphureous water, quite colourless and transparent, resembling in appearance the natural. He says, that this sulphureous water has these peculiarities, that acids do not render it turbid, as they do all other artificial solutions of sulphur; but that lixivium of tartar, which increases the brightness of the natural sulphureous waters, on being dropt into this, immediately makes it lose its transparency.

Sulphur

Sulphur is prescribed both as an external and an internal remedy.

It has long been celebrated for its efficacy in removing the itch and other cutaneous disorders, by being rubbed on the parts affected. Dr. Mead and other late authors alledge, that the itch does not depend on any fault in the fluids, but on insects forming nests in the skin, and that the sulphur proves a poison to them; but as it does not affect their eggs, it is sometimes necessary to repeat the sulphureous unctions, after some little time, in order to destroy any insects which may have been produced from the ovula after the former frictions. Whether the itch is produced from insects, and is cured in the manner here alledged, I cannot say; but certain it is, that sulphur, mixed with hogs lard, or with other unctuous matter, or with butter milk rubbed on the affected parts, is a very efficacious remedy for removing the itch. I have seen in a microscope, insects which were said to have been taken from itchy eruptions.

It has been observed, that people, under a course of sulphureous unctions, are more

apt to catch cold than at other times; and, therefore, such patients ought not wantonly to expose themselves to the inclemency of the weather: and during such courses, many practitioners have advised to give sulphur internally at the same time that it is rubbed on the skin; and to make the patients take a few doses of physic after the frictions are over, from a notion that sulphur applied externally repels the morbid matter, which the sulphur and purgative medicines taken internally carry off by the intestines and the other secretory organs; other practitioners have thought these precautions unnecessary, but I cannot help differing from them in opinion, for I have generally seen good effects from their use; and I think there is reason to believe, that sulphureous ointments sometimes repel morbid matter; for I have often seen fevers return, where they have been rubbed too soon on the skin to remove an itchy eruption, which had appeared in the course of a fever, and the fever has gone off again, on laying aside the sulphureous unctions.

Sulphur taken as a medicine, from one to
two

two or three drams, generally proves laxative. It is often joined to some of the mild eccoprotics; such as magnesia, crystals of tartar, manna, cassia, lenitive electuary, and given to keep the body open in cases of piles, and of uterine and other hæmorrhages, because it does not stimulate or heat during its operation; nor leave a disposition to costiveness, as rhubarb, aloes, and other hot or resinous purges are apt to do; nor does it relax the intestines, or leave them subject to flatulency, like the neutral salts. However, it ought to be observed, that opening medicines ought to be joined to it, or given from time to time to carry it out of the body; for we have several instances related by authors, of its having accumulated within the bowels, and brought on troublesome symptoms; and I once saw a case of this kind myself in a lady, who, being in a bad state of health, was advised to take daily a spoonful of flowers of sulphur, which she continued to do for two or three weeks without receiving any benefit. Some months after this, her former complaints remaining, with the addition of an uneasiness of her bowels, she was advised

to try the warm bath, and having taken a dose of physic after using the bath five or six times, she passed by stool a large quantity of whitish heavy stuff, which on being thrown into hot water, washed and examined, was found to be sulphur. She told me she had not taken a grain of sulphur for five months before. She passed some of the sulphur daily, for five or six days after, and the uneasiness of the bowels went off; though her other complaints remained.

Formerly sulphur was much recommended in coughs and diseases of the breast, but of late its virtues as a pectoral have been much doubted; and it has been very little prescribed in such complaints; though Hoffman says, that he has found it of service where there has been a scrophulous or scorbutic habit.

It has been a dispute amongst practitioners, whether sulphur in its crude state, in form of flowers or of lac sulphuris, enters the blood. *Geoffroy* and others have alledged, that silver money, and silver watches have been tinged of a yellow colour in the pockets of those who have been taking sulphur, while others

have

have denied that it ever produced this effect; this question I cannot determine from my own observation, but the general belief is, that it does; and therefore it is often prescribed as an internal medicine in cutaneous disorders.

Sulphur is administered in substance, either in form of flowers, or of the *sulphur precipitatum*, commonly called *lac sulphuris*; it is given in doses as an alterative from ten to thirty grains; and as a laxative from one dram to four: the *trochisci e sulphure* of the London Dispensatory, which are made of one part of flowers of sulphur, two of sugar, and a sufficient quantity of mucilage of quinces, is an elegant and pleasant way of using it in a dry form.

Sulphur united with an alkaline salt in form of a *hepar sulphuris* is soluble by our juices, and undoubtedly enters the blood, when taken as an internal remedy. It is a stimulating heating medicine, is alcalescent, and corrects any acidity it meets with in the stomach and bowels; and it promotes the excretions, particularly that by the skin, when assisted with warm drinks. I have

frequently ordered with advantage the *hepar sulphuris* in small doses, from five grains to a scruple, made up into a bolus with conserve, to patients labouring under cutaneous disorders; and recommended to them to drink a pint or more of some weak liquor after it; and I have often seen the itch cured by patients washing frequently the itchy parts with a solution of a dram of *hepar sulphuris* in a pint of water.

An artificial sulphureous water may be made, by dissolving a scruple or half a dram of the *hepar* in a quart of water, and it may be used as a *succedaneum* for the natural sulphureous waters by the poor, or those who cannot afford to go to the natural fountains. And if a dram of *hepar sulphuris*, and half an ounce of sea salt, and an ounce of Epsom salt be dissolved in two quarts of spring water, it will form a sulphureous purging water, which may be used for carrying off worms and other foulness from the bowels.

Dr. Willis, and other authors of his time, have recommended the *hepar sulphuris*, and
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the tincture of sulphur in spirit, as a remedy for the consumption and internal ulcers; but experience has shewn, that they are of too heating a nature to be used in such cases.

Solutions of sulphur in oils, both in the expressed or essential, as I before observed, used to be kept under the names of balsams, and were employed both as external and internal remedies. Both Boerhaave and Hoffman think, that they may be employed as external applications, but that they are of too stimulating and heating a nature to be used as internal remedies. The dose of the simple balsam, is from six or eight, to forty drops; and of the balsam made with the essential oils, from four or five to forty. At present, they are seldom used in this country.

As sulphur, when intimately united to quicksilver and antimony, and other metallic substances, prevents their acting on the human body; it has been proposed to give sulphur, when these metallic substances have been taken as medicines, and act with too great violence, in order

to check their operation; but it has not been found to answer; the animal powers not being sufficient to unite sulphur with them, so as to stop their operation within the body.

Flores Sulphuris.

Flowers of Sulphur. Let any quantity of yellow sulphur, grossly powdered, be put into a proper vessel and sublimed. If any of the flowers have concreted during the operation, they are to be reduced to a fine powder, either by a mill, or in a mortar.

As in this operation, often a quantity of the vitriolic acid is let loose, which mixes with the flowers; it is necessary to boil them in water, and afterwards to wash them in cold water to free them from this acid, and to render them fit to be used as medicines.

This process makes no change in the qualities of sulphur; it only serves to free it from impurities.

These flowers are generally sublimed in large quantities at a time, in chambers fitted for the purpose, by people who make a business of it.

C H A P. VIII.

OF FOSSIL OILS AND BITUMENS.

HAVING considered sulphur and its preparations, I come next to treat of fossil oils and bitumens.

S E C T. I.

Of Fossil Oils.

FOSSIL oils have been found in many countries. They commonly issue from the clefts of rocks mixed with water, though in some places they rise in springs of water from the earth, and are either found floating on its surface, or sunk to the bottom of the wells: they seldom rise pure and unmixed, into wells of their own.

These oils have different appearances as they rise from their fountains, and have got
different

different names, according as they are more or less pure. The finest sort, which is limpid and crystalline, has been called *naphtha*. The second sort, which is of a light amber colour, and transparent, has been called *rock oil*, and yellow *petroleum*. The third sort, which is of a much deeper colour than the last, has been called *coarse petroleum*. And the coarser sorts, which are of a black colour, *pisaspphaltum*, and *pisceleum*, according to their consistence, or as they are more or less fluid; and all these fossil oils have been called by the general name of *petroleum*, owing to their springs issuing commonly through fissures of rock.

Mr. *Geoffroy*, in the first volume of his *Materia Medica*, mentions, that a fine sort of this oil is found in the east end of the island of Sumatra, which, *Bontius* says, the natives use in paralytic cases, and esteem so much as to prohibit the exportation of it under pain of death.

In many parts of *Italy*, but particularly in the country of *Modena*, there are a great many springs of these oils; the one which affords the whitest, most fluid, and most inflammable,

inflammable, rises from mount Cibitto; the others yield a fine transparent amber-coloured oil, which is called rock oil; and oils of the same kind are found in *Persia*, in *Spain*, at *Beziers*, in the province of *Languedoc*, in *France*, in some of the islands of the *Archipelago*, and in other countries; at *Pitchford*, in Shropshire, and at *Liberton*, about three miles from the city of *Edinburgh*, are wells which afford a black coarse sort of these oils; and an oil of the same sort is brought from the island of *Barbadoes* in the West Indies; in short, such oils are found almost in every country.

The white or finest sort of these oils, which has been called naphtha, is said to be the lightest of all known liquors, alcohol not excepted; it admits of no mixture without altering its appearance, so cannot be counterfeited; it takes fire almost as easily as gun powder; dropt into water, it spreads over its surface to a surprising distance: the strongest frost makes no impression upon it.

The finer sorts of these oils are extremely volatile, and if a candle be brought near their wells, or to where they stand in an open

open vessel, they catch fire and flame; and if left long in an open bottle, a great part of them evaporates, and what remains becomes thicker.

All these oils are acted upon by the fixt vegetable alkali in a caustic state. They unite with essential oils and with æther, but not with alcohol. They mix with strong mineral acids, and become thick by the mixture, and in time acquire the consistence of a bitumen.

Geoffroy says, if the finer sort be distilled in a retort, that the first oil (or liquor) which comes over, is a great deal more pellucid than the original petroleum, loses a good deal of its subtile fragrant smell, and yields a less fuliginous, but a more languid flame than before it was distilled, and leaves behind in the retort a yellow dreg; hence he thinks that no perfection is added to these oils by distillation.

Macquer and many other chymists have alledged, that there is but one original sort of fossil oil; that all the different sorts we meet with, are only this original oil variously united to different heterogeneous mixtures:
how

how far this may be true I cannot say, having never tried any chymical experiments to determine this question ; but Dr. Longfield told me, that he had distilled pit-coal, and got two different sorts of fossil oil from it.

Mr. Macquer, in the second volume of his Chymistry, seems to think, that the fossil oils and bitumens are of vegetable origin ; and that they were at first vegetable, resinous, and oily matter, which, by laying long in the bowels of the earth, had been intimately united to the mineral acids, and contracted properties different from those of the vegetable essential oils and resins ; and in proof of this he alledges, that we can prepare an artificial bitumen by the mixture of the vegetable balsams and mineral acids. How far this opinion may be true, must be left to be determined by future observation and experiment.

All the fossil oils, especially the finer sorts of them, have a fragrant, volatile, and somewhat of a fetid acidulous smell, and a hottish, penetrating, bitterish taste.

They are aromatic stimulating substances, particularly the finer sorts of them ;

them; and in the countries where they are found, they are much used for external applications. They have been rubbed on parts affected with the palsy, or with rheumatic or other pains, and for discussing indolent swellings.

The finer sorts being warm and cordial medicines, which promote perspiration, have been often given as internal remedies, to remove paralytic complaints and spasms. Dioscorides has recommended them as good remedies in disorders of the uterus, and for killing worms. They have been but little used in this country for many years.

The doses ordered as internal medicines, have been five, ten, twenty, or more drops, to be swallowed in a glass of wine.

The Petroléum Barbādense, Barbadoes tar, is a coarser sort of fossil oil, and is now the only one remaining in the London Pharmacopœia. The present practice seldom uses it, though in the former Pharmacopœia, there is a balsam of sulphur ordered to be made with it, and an oil to be distilled from it.

It has been much employed in the London hospitals, when joined to sulphur, and to some soft oil and the vegetable alkali, as an application for curing scald heads: I have often ordered such ointments, but they did not prove so efficacious as I expected.

There is a coarse sort of fossil oil, which is got from pit-coal, and sold under the name of British oil, which is used by the lower class of people.

S E C T. II.

Of Bitumens.

BITUMENS are hard friable substances, which chymists say are composed nearly of the same principles as the fossil oils, but more intimately united with the vitriolic acid; and *Macquer* affirms, that they bear the same analogy to the fossil oils, as resins do to the vegetable essential oils.

Mr. Geffroy thinks, that they were all originally in a fluid form; that they are generated in the bowels of the earth, from whence

whence they are conveyed by water in the chinks or fissures through which water runs; and that they soon harden, and are either found floating in water like the bitumen Judaicum and amber; or concreted in the bowels of the earth like the *pit-coal*, and the gagates or *jet*.

They melt in the fire and flame. They are soluble in both the unctuous and essential oils and in æther; but not in spirit or water, though by the assistance of the caustic vegetable alkali and heat, they may be in part dissolved by water.

There are none of the solid bitumens now retained in the Pharmacopœia, except the *succinum*, or amber. The *ambergrise* and the *bitumen Judaicum*, which were the two in most repute, are now thrown out.

Ambragrifia.

Ambragrifia. The *ambergrise* is a solid, light, opaque mineral substance, of the bituminous kind; the origin of which is not well known. It is found floating on the sea, and lying on the sea-shore in Africa,
and

and in the East Indies ; and it has been sometimes found in the bellies of whales.

It has an aromatic smell, but not strong, till it be mixed with other aromatic substances, when it raises their fumes greatly ; and a small quantity of it mixed with wine, has been believed to render it very intoxicating. It was formerly in great repute, and was reckoned to be cordial, stomachic, and anodyne, and was given from ten to fifteen grains for a dose. It is now almost only used by the perfumers in this place, being never given as a medicine.

Bitumen Judaicum.

Bitumen Judaicum. Jews pitch is a hard bitumen, called asphaltus ; is got from the lake of Judea, which abounds so much with bituminous matter, that no fish will live in it. It is very difficult to get genuine specimens of it. It has the general properties of bitumens, but is now never used as a medicine.

Succinum.

Succinum. Amber is a solid, hard, semipellucid or transparent bituminous substance of a particular nature; it has been called *ambra* by the Arabians, and *electrum* by the Greeks.

It is of different colours, white, yellow, black, &c. The white is the most esteemed for medicinal purposes, as being the most odoriferous, and containing the greatest quantity of volatile salt; though the yellow is most valued, by those who manufacture beads and other things with it, by reason of its transparency. It is found in many parts of the world near the sea-shore, and floating in the sea, particularly in the East Indies, and on the coast of Prussia in Europe. Many of the ancients believed it to be the resin or gum of some tree, particularly of the poplar, though others ranged it among the mineral substances; but from the nature of the matters which it yields by distillation, and from the accounts given by Hoffman and others, of its having been dug out of the bowels of the earth in Prussia, and in
other

other countries, it is now generally agreed upon, that it is a true bitumen of fossil origin.

It has a subacid resinous taste, and fragrant aromatic smell, especially when dissolved. It differs from the other bituminous substances in this, that it yields by distillation a volatile acid salt, which none of the others do; otherwise it affords the same sort of principles as them, viz. an acid phlegm, an oil which gradually becomes thicker, as the distillation is continued; and when the operation is finished, there remains a black caput mortuum in the retort.

Authors differ very much with respect to the proportions of the different matters which it yields by distillation; but this probably has been owing to the different specimens of it which they made use of; for *Geoffroy* observes, that a pound of the white amber afforded him four drams of the volatile salt; and that the same quantity of the yellow scarce afforded a dram.

By *Lemery's* analysis, 32 ounces of amber afforded of spirit half an ounce, of white pellucid oil five ounces and a half, of black

oil twelve ounces and a half, of volatile salt half an ounce, of caput mortuum twelve ounces.

By *Newman's* analysis, according to *Cartheuser*, 16 ounces yielded of oil near 12 ounces, of phlegm an ounce and a half, of acid salt four drams and a half, of caput mortuum an ounce.

By *Dr. Lewis's* account of amber, given in his *Complete Course of Chymistry*, in note to page 221, when boiled in water, it neither softens, nor undergoes any sensible alteration. Exposed to the fire in an open vessel, it melts into a black mass, very like a bitumen: It is partly soluble in spirit of wine, and likewise in some essential oils, but it is with difficulty that the expressed ones are brought to act upon it; the stronger sorts of fixed alkaline lixivium almost totally dissolve it.

By *Mr. Geoffroy's* account, it is dissolved in spirit of wine, and likewise in the essential oil of lavender, and of spikenard (*spicæ*), and in linseed oil, but with difficulty.

Mr. Macquer, in the second volume of his *Practical Chymistry*, says, that *Mr. Geoffroy*

Geoffroy had observed, that amber, reduced to a fine powder, yielded its salt to boiling water, by being infused in it, in the same manner as benzoïn; and therefore he concludes that succinum bears the same analogy to bitumens, as benzoin does to resins.

Amber in substance has been much recommended as a nervous and cordial medicine; and alledged to be very efficacious in promoting the menstrual discharge; and the exclusion of the foetus and secundines in labour; but as in its crude state, it is quite insoluble by our juices, it certainly can have very little effect on the animal system; and therefore it is now seldom prescribed as a medicine in this form.

1. *Tincture of Amber.*

About fifty years ago, tinctures drawn from amber were in great repute. Boerhaave, in his Chymistry, vol. 2d. process 58, recommends much a tincture drawn with alcohol from powdered amber, which had been reduced to the state of a paste, by being digested with oleum tartari per deliquium, by shaking it, and digesting it in a sand heat

for some hours ; after it has become quite cold, he orders the clear tincture, which has acquired a red colour, to be decanted off, and to be kept for use. He says, that this is a most powerful remedy in all cases where there is too great a degree of irritability of the nervous system ; and is extremely useful in hypochondriacal, hysterical, low leucophlegmatic, and convulsive complaints ; and adds, that it is recommended both by the honourable Mr. Boyle and Van Helmont, in cases of spasms and epilepsy.

Dr. Lewis, in his New Dispensatory, mentions, that the dulcified spirit of vitriol is one of the best menstrua for drawing a tincture from amber, and adds to its virtue ; and he says, that this tincture is a fine cordial medicine, and may be used with advantage, in low, nervous, and hysterical disorders, as a bracer and antispasmodic ; and that it may be taken to the quantity of a tea-spoonful two or three times in the day.

In the Swedish Pharmacopœia for 1787, there is a tincture of amber (*succinum*) ordered to be prepared by digesting, for three days, an ounce of yellow amber powdered in
vitriolated

vitriolated æthereal spirit, and then filtering it through paper.

The salt and oil obtained in distilling amber (*succinum*) are both used as medicines.

2. *Salt of Amber.*

Sal Succini. The salt of amber is a particular sort of acid salt; it dissolves entirely in spirit of wine, and likewise in water of a boiling heat, but it crystallizes again when the water grows cold; it may be kept suspended in the water, by adding sugar to its solution while hot.

It forms a different neutral salt with each of the three different alkalies, as in the following table :

<i>Acid.</i>	<i>Alkali.</i>	<i>Neutral Salt.</i>
<i>Sal Succini.</i>	{ vegetabile	Alkali vegetabile succinatum.
	{ minerale	Alkali minerale succinatum.
	{ volatile	Alkali volatile succinatum.

Some chymists had alledged that this salt was an acid of the vitriolic kind, and Monsr. Bourdelin, in the French Memoirs of the Academy of Sciences for the year 1742, had endeavoured to prove that it was a muriatic

acid; but from the experiments made by Dr. Neuform, and those I made with this salt in the year 1768, an account of which is inserted in the 58th volume of the Philosophical Transactions, it is evident that the sal succini is an acid of a particular kind; and the neutral salts made with it very different in taste, smell, and other properties, from those made with the muriatic acid. None of the neutral salts, made with this acid, have hitherto been used in practice to my knowledge, except the one made with the volatile alkali, which is said to have acted as a diuretic in dropsies, when given in repeated doses of a scruple each, every four or six hours.

The salt of amber itself has a grateful acid taste, and is evidently a gently stimulating, cordial, and antiseptic medicine; at the same time, that it is an excellent diuretic, and promoter of the other watery excretions; on these accounts it is used in fevers, especially those of the low and putrid kind; it has often been joined to castor, valerian root, serpentaria, and other cordial medicines; it has likewise been recommended as an anti-hysteric

hysteric medicine, and is useful for promoting the menses; and it is sometimes joined to the fetid medicines in cases of this kind. Boerhaave, in his Chymistry, calls it the *Antihysteriæ & Diureticæ Princeps*.

The common doses given of it have been from five grains to a scruple.

3. *Oil of Amber.*

Oleum Succini. The oil of amber scarce differs from the fossil oils I have already mentioned. It has been used externally for discussing indolent swellings, and it has been rubbed on paralytic limbs, as a warm stimulating remedy. When rectified, it is used as a warm cordial medicine, and given for promoting the watery secretions. It has been esteemed to be a good antihysteric remedy, and useful for promoting the menses. It has been used for allaying spasms and convulsions, and been prescribed in epileptic and other convulsive disorders; and it has been thought to allay the violence of the fits of coughing in the chincough, and

and to shorten the duration of the disorder. The doses ordered have been generally from five to thirty drops, in a proper vehicle.

C H A P. IX.

OF VEGETABLE AND ANIMAL
OILS.

HAVING considered the fossil oils, I come next to take a view of those belonging to the vegetable and animal kingdoms, of which there is a great variety, which have been divided into different classes by authors; but those which are used in medicine may be reduced to two; 1st. The *unctuous*: And 2d. The *essential*. Under the title of unctuous, I shall comprehend both the mild vegetable and animal oils; and likewise the *empyreumatic*, which are the same oils, only changed in their properties by the force of fire.

All oils are substances, which contain a large quantity of phlogiston, or inflammable matter ;

matter; but what this phlogiston is, has not as yet been determined; chymists hitherto not having been able to procure it separate from other bodies. Mr. Kirwan, in the 72d volume of the Philosophical Transactions for the year 1782, says, that phlogiston exists in two states, 1st. In a solid form, when it is joined to other bodies; 2d. In an aerial elastic form, when it is disjoined from them. In the first state it is called *phlogiston*, in the second, *inflammable air*.

S E C T. I.

Of Unctuous Oils.

THE unctuous oils, when pure and recent, have neither taste nor smell, but feel soft and oily in the mouth; they are the produce both of the animal and of the vegetable kingdom.

The *native animal oils* are found in the cellular membranes, and in the cells of the bones of animals, and are formed of the oleaginous particles of our food, which had been

been taken up by the absorbent vessels, for the purposes of lubricating and softening the fine membranes, the joints and other parts, and of keeping the bones of a due temperature, and preventing their becoming too brittle; and of blunting the too great acrimony of the animal fluids and salts; and a quantity of these oily particles are deposited into the cells of the bones, and of the softer parts, by way of store, to be reassumed into the mass of blood when wanted. When fresh they are quite mild, and have no taste; and those of quadrupeds and birds, when cold, concrete into a firm white mass; and those of fishes, all, except some of the oily parts of the whale, remain fluid in the cold.

The oils of vegetable substances are generally deposited in the cellular parts of the seeds and fruits, and are procured from thence either by expression, or by bruising the seeds or other parts of the plant containing the oil, and boiling them in water, when the oil rises to the surface of the water, and is separated from it when cold: these, as well as the native animal oils, are, when pure and fresh, quite mild and unctu-

tuous, without either taste or smell; they generally remain in a fluid state; while the heat of the air raises the quicksilver of the thermometer above the freezing point.

Both the vegetable and the animal oils, though they be mild and insipid when quite pure and fresh, yet if they be exposed to the air till they undergo a kind of fermentation, acquire a sharp acrid taste and a strong smell; lose their colour, and become what is commonly called rancid.

When these oils are put into a retort and distilled, there first comes over an insipid watery phlegm, which becomes more and more acid as the distillation advances; then a sharp oil of a disagreeable smell, the colour and consistence of which increase till the operation is finished; and there remains in the retort a bituminous matter, insoluble in spirit, but soluble in æther, which by calcination yields a vitrescible matter (or coal), which chymists have reckoned to be the characteristic of a mucilage. During the time of the distillation there escapes a quantity of fixed air. From this analysis it has been concluded, that these oils are made up of a watery phlegm, an acid, an æthereal oil, and phlogiston soluble in spirit,

rit, a mucous matter, and a large quantity of fixed air, which escapes during the time of the distillation.

Mr. Morveau says, that it is this fixed air which occasions the sharp vapours that arise during the time that these oils are kept boiling in an open vessel ; and is the cause of their rusting iron and brass ; for when they are deprived of it, they have no such effect on these metals ; and he adds, that it is the loss of this air which is the cause of their becoming rancid ; and that when they are rancid, if we restore this air to them, they become again fresh and sweet.

The properties of fresh, mild, unctuous oils, with respect to other bodies, are :

They are miscible with the stronger acids, and by this mixture they become thick, and acquire consistence ; the nitrous and vitriolic acids coagulate the fluid oils, and render them as firm as tallow ; and the vitriolic turns them of a black colour.

Mr. Morveau, in the 3d volume of his *Elemens de Chymie*, &c. mentions ; that a soap soluble in water may be formed, by uniting oil which has been separated from soap by

means of an acid, then dissolved in alcohol, and separated again from it by means of water, with the vitriolic acid; or by simply heating the oil disunited from soap, and then adding to it by degrees the vitriolic acid. And he says that the nitrous acid forms with these oils a sort of bitumen, which is insoluble in water.

It has been found, that in general the thicker the oils are, the greater quantity of acid they contain; hogs-lard, butter, tallow, and wax, yield more acid by distillation, than almond, olive, or other fluid oils; and these fluid oils acquire consistence by being incorporated with acids. May not this be one reason why publicans, and others, who eat heartily, and drink a great quantity of beer, wine, and other liquors which contain a quantity of acid, often grow corpulent?

The animal oils are scarce miscible with the fixed alkalies, in their mild state; but when they are rendered caustic, they unite intimately with them, and form a soap.

They are not miscible with any of the neutral salts, except the regenerated tartar
and

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and vegetable ammoniac, and that only in a small degree.

They mix readily with the empyreumatic and essential oils; and they dissolve sulphur, and vegetable resins and balsams.

They do not mix with alcohol in their natural state; but if they be repeatedly distilled, they become more and more subtile and volatile, and approach nearer to the nature of essential oils, and may then be easily mixed with it.

They dissolve some of the baser metals, such as lead and tin, and they corrode copper; with lead, they serve as the foundation of some of our plasters.

They unite with quicksilver by being long rubbed with it in a mortar; particularly with hogs-lard, and the other thick animal oils; and it is in this manner that all our mercurial ointments are made. It has been the general opinion that the quicksilver is only divided, and its particles suspended, by the adhesive power of the hogs-lard, or other animal oil, that is used in making these preparations; but Mr. *Morveau*, and some other late chymists, suspect that it is
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in part dissolved by the acid of these oils, particularly when the oils have become rancid ; for in that state they dissolve the quicksilver sooner, and are more tenacious of it than when they are fresh ; in proof of which *Monf. Beaumé* tells us, that he melted an ounce of mercurial ointment, which was newly prepared, with fresh hogs-lard, and an ounce of another ointment in which the lard had become rancid, and kept them both in fusion for eight days, and in that time the fresh ointment let drop three drams of the quicksilver, and the rancid ointment only a dram and a half.

Unctuous oils do not affect antimony, but all of them dissolve arsenic ; and it has been proposed to make a solution of this mineral in oil, for covering the bottoms of ships with, to guard them against worms.

They do not mix with water, without the intervention of some other substance ; the caustic alkali renders them miscible with water ; and a small quantity of the common volatile unites the vegetable oils with it, and has been commonly employed for preparing oily draughts and juleps.

It has been long known that these unctuous oils may be suspended in water, by triturating them in a mortar with finely powdered gum, or thick mucilages prepared with it. The late Dr. Fothergill caused a number of experiments to be made relative to this subject; and it was found that half a dram of mucilage, made with two parts of water and one of gum arabic, kept suspended an equal part of oil of almonds, or a scruple of any of the natural balsams, in an ounce and a half of water; and that half an ounce of the same sort of mucilage is capable of keeping an equal quantity of sweet oil suspended in an ounce and a half of water; that the addition of a dram of syrup makes them mix easier; and a dram or two of some of the spirituous waters makes the draught more agreeable to the palate. Almonds, and the kernels of walnuts and of other nuts, which abound both with oil and mucilage, yield both these principles to water, and form an oily emulsion; by being first beat into a pulp, and then well triturated, while the water is mixed by degrees with them; and the mucilaginous and saline parts of the
kernels

kernels of these nuts, not only render their own oil miscible with water, but likewise dissolve and keep suspended in water a certain portion of camphor, or of other essential oils; and are frequently employed for this purpose.

When gums or their mucilages are used for mixing oils with watery liquors, no alkali must be added, for it destroys the acid of the gum, and renders both effete.

The yolks of eggs likewise serve as a menstruum for mixing oils with watery liquors, and answer the purpose well on many occasions.

S E C T. II.

Animal Oils.

THE *animal oils* are mostly employed for external purposes, and some of the thicker ones, such as *hogs-lard*, *tallow*, and *wax*, are much used for the preparation of ointments and plasters.

Wax has sometimes been given inter-
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nally, it was an ingredient in the balsamum Locatelli, which was formerly much used as a pectoral and healing medicine; it was made of a pint of olive oil and half a pint of Strasburgh turpentine, and as much bees-wax, to which the London college added six drams of red sanders in powder; the Edinburgh, two ounces of balsam of Peru, and an ounce of dragons-blood. Wax has likewise been mixed with testaceous powders, and given in dysenteric cases; and it is mixed with the vitrum antimonii, to render its operation milder. Wax dissolved in water into the form of an emulsion, by means of soap, in the following manner, was much used in the war in North America, in the year 1760, and found to be of service in recent dysenteric cases, after the necessary evacuations had been premised:—Take of bees-wax three drams, of white Castile soap one dram, of water half an ounce, put them into a small tin pot, and melt them over the fire; while they are kept stirring about with a spatula, pour them into a marble mortar; and when they begin to cool, add by degrees a quart of water, keeping rubbing

rubbing the ingredients with the pestle of the mortar, that they may incorporate with the water, and form an emulsion; to which some sugar, and a little cinnamon, or other spirituous water, may be added, to make it more agreeable.

Dr. Vogel, in his *Institutiones Chemiæ*, says that wax is an inflammable substance, gathered by the bees from the stamina and the leaves of some flowers; that it is imperfectly soluble in alcohol, and seems to be a resin intimately mixed with an unctuous substance: but Mons. Morveau thinks that it does not differ from other oils but in containing a greater quantity of acid, which gives it consistence; for that if you separate this acid by repeated distillations, it is reduced to the state of a fluid oil.

Sperma Ceti.

The animal oil, very improperly called *sperma ceti*, Dr. Lewis says, is obtained by boiling, and purifying with an alkaline lixivium, the oil of a species of the whale, called *Phyfeter Macrocephalus*; it is brought to market in form of a solid, unctuous flaky substance, of a

snowy whiteness, which has a soft butyraceous taste, without any remarkable smell. It has been much employed in coughs and in other complaints, where a soft unctuous oil is wanted. It is sometimes rubbed with sugar, and taken in a dry form; at other times it is beat up with the yolk of an egg, or triturated in a mortar with gum arabic, and mixed with watery juleps or draughts.

*Oleum Viperinum, — Axungia Porcina, —
Oleum Pedum Bovinarum.*

The *viper* and *hogs lards*, the *neat's feet* and other fluid animal oils, are used externally for softening and relaxing the fibres; and their effects are more permanent than those of watery fomentations. They are often rubbed upon joints, and other parts, which have become too stiff and rigid, with a view of making them supple, and recover their motion. They are likewise employed to remove spasms, and to ease pain; and they are mixed with poultices, to prevent their growing hard.

S E C T. III.

Vegetable Unctuous Oils.

THE vegetable expressed oils are very numerous, great numbers of seeds, fruits, &c. yielding, by expression, an unctuous oil. At present a few only of the mild ones, and one or two which have a laxative quality, are used medicinally; and therefore I shall only take notice of the following; 1. *Oil of Sweet Almonds.* 2. *Oil of Olives.* 3. *Oil of Linseed.* 4. *Palm Oil.* 5. *Castor Oil.* 6. *The Oil of the Seeds of the Physic Nut-tree.* 7. *The Oil of the Nuts of the Arundel tree in the East Indies.*

Oleum Amygdalarum & Oleum Olivarum.

Oleum amygdalarum & oleum olivarum, the oil of almonds and oil of olives, supply, in general, the place of all the other mild unctuous oils for internal and medicinal purposes. So far as we know, they produce nearly the same effects on the human body; in the stomach and intestines, they lubricate

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the passages; they blunt and obtund any acrimonious substances they meet with, and assist in removing spasms from the fibres; hence they are given where any acrid saline substance, which irritates the stomach and bowels, has been swallowed by mistake; or any acrimonious matter is lodged in them, which creates uneasiness: they are often mixed with clysters, or thrown up pure by way of clyster, in order to lubricate the great guts, and procure stools, when any thing irritating is lodged within them; and frequently four, five, or six ounces of pure oil mixed with 40, 50, or more drops of tinctura thebaica, are thrown up to ease pain, and tenesmus, which proceed from the stone, or dysentery. These oils, taken in small and frequent repeated doses, generally sit easy on the stomach, and prove laxative; and frequently they are joined to manna, and other medicines of this kind, to make them have that effect. Half an ounce of these oils mixed with a dram of manna, and six drams of any of the common purging salts, and dissolved in an ounce and a half of simple pepper-mint water by means of a small quantity

quantity of the yolk of an egg, makes a mild purging medicine, which commonly operates freely without griping; the addition of a dram or two of spirituous cinnamon-water, makes the draught sit easier on the stomach. These oils taken in large quantity immediately create a nausea and sickness, and occasion vomiting; and are frequently employed for these purposes, where people have swallowed by mistake saline, acrid poisons.

When mild unctuous oils are taken up into the blood by the lacteal and lymphatic vessels, the animal process soon mixes them with the other circulating fluids; and they uniting with the acrimonious salts and putrescent particles, render them mild; hence we see the use of the fat and oil, which is accumulated in the cellular membranes of the soft parts, and in the cells and cavities of the bones, which is taken up by the absorbent vessels, whenever the momentum of the blood is increased by fever, or other causes. Besides the effects which these oils, taken up into the circulation, have upon the acrimonious particles of the blood, part of them

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is thrown out by the secretory vessels upon the membranes, and into the different cavities of the body, to lubricate and defend them against acrid irritating matter; and these oils are prescribed in nephritic cases, to smooth and lubricate the urinary passages, and to forward the expulsion of sand and gravel; in pulmonic disorders, where there is a thin rheum, that irritates the bronchi, and keeps up a tickling cough; in cases after child-birth, where the lochia are too sharp and acrid; in spasmodic disorders, which we suspect to depend upon acrid matter; and in many other cases where a lubricating, obtunding, inviscating medicine is wanted.

These oils cannot be taken pure in sufficient quantity to answer the purposes intended, because they raise a nausea; and therefore they are commonly made into emulsions, by mixing them with some watery menstruum; either by means of the yolk of an egg, or of gums, or of the volatile alkaline spirits; or by beating, and triturating in a mortar, almonds, and other substances which contain them, and at the same time principles

ples fit for mixing them with water, and adding by degrees a sufficient quantity of water.

These vegetable unctuous oils are used as external remedies, as well as those of the animal kind.

The late Dr. Oliver of Bath, many years ago, wrote a letter to me, mentioning, that he had cured six dropfical patients, by making their bellies be rubbed for a quarter, or half an hour, morning and evening, for some time. I have often ordered this remedy to be tried in dropfical cases; and have seen it give great relief, but never make a cure of an ascites. In anasaruous cases, I have frequently seen patients receive great benefit, from rubbing, not only the abdomen, but likewise the legs, morning and evening with these oils.

These soft unctuous oils mixed with camphor, or with volatile alkaline salts, or such other stimulating substances, form liniments proper for rubbing on the skin, which not only soften and relax the fibres, but likewise, by their stimulus, increase the oscillatory motion of the vessels, of the parts
they

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they are applied to; and by these means become good discutient remedies; and are often used as such, in tumors and pains, where there is no great degree of fever or inflammation; the addition of opium to such liniments gives them an anodyne quality.

Oleum Lini.

Oleum Lini. Linseed oil is expressed from the seeds of the common lint; it is of a mild and unctuous nature, and more used for external applications, than as an internal remedy; though *Bergius* says, that it has been sometimes given with good effect, and produced stools in the iliac passion. Mixed with lime-water, in the proportion of an ounce of the oil to three drams of lime-water, it proves one of the best applications known, for easing pain, and promoting the cure of recent burnt parts.

Oleum Palmæ.

Oleum Palmæ. Palm-oil is procured from the kernels of the fruit of the palm-oil tree, which now grows in the West Indies,

Indies, and on the coast of Africa. This oil is of an orange colour, is about the consistence of an ointment, and has a strong, though not a disagreeable smell, and but very little taste. By keeping it becomes white and unfit for use. It is never given as an internal remedy in this country, but has been used as an application for allaying pain, for removing cramps, and for sprains, weakness of the nerves, &c.

Oleum Ricini.

Oleum Ricini, seu *Oleum Palmæ Christi*. This oil, which commonly goes by the name of castor oil, is got by expression from the seeds of the shrub called *ricinus vulgaris*, or *palma Christi*. What is procured by simple pressure without the assistance of heat, is esteemed the best. This oil, when pure, is limpid, and has little or no taste, and is of a purgative nature; it is much used both in the East and in the West Indies, as a mild purging medicine, in the dry belly-ach, in the iliac passion, in cases of worms, and in other complaints of the bowels. Its dose to an adult, is from half an ounce to two ounces; and
to

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to children, from a dram to half an ounce. It is administered in different forms, by itself; in broths, or water gruel; made into oleo-saccharum, with lemon, or lime juice and sugar; mixed with honey and watery liquors; or made up into draughts with some of the simple distilled waters and gum arabic. And some people swallow it swimming on simple peppermint water, or in a glass of rum and water. When it is intended to quicken its operation, it is common to add to it a dram or two drams of tincture of rhubarb, or of jalap, or of senna. The seeds themselves, from which the oil is drawn, are strongly purgative; two or three of them often acting as strong hydragogue and emetic medicines; instances of which I have seen. It is said that this violent purgative quality is lodged in the outer skin, and the fine membranes which cover them; and that if these be all carefully picked off, that they have no such violent operation.

Oleum Seminum Ricinoidis.

Oleum Seminum Ricinoidis, seu Ricini Americani majoris. The oil of Barbadoes
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nuts,

nuts, or of the nuts of the physic nut-tree. This is an oil of the same nature as the castor oil, but is a much stronger purgative medicine; half an ounce proving a strong hydragogue purge in dropsies. It is not much used in the West Indies, on account of the violence of its operation.

There are a number of other plants and trees, the fruit or nuts of which yield an oil which has a purgative quality.

Oleum Nucis Indicæ, Arundulum dictum.

At Bombay, Gambroon, and Surat, in the East Indies, there grows a tree which bears a nut inclosed in a rough husk, which resembles much the horse-chestnut; and the kernel of the nut yields an oil by expression, which is of a purgative nature; a tea spoonfull of it is reckoned a dose: the tree goes by the name of the *Arundel tree* at Bombay, and its oil by that of the *Arundel oil*. Mr. Sinclair, one of the surgeons belonging to the royal regiment of artillery, who was formerly surgeon to an East India ship, gave me a small bottle full of this oil, which he said

said was much used for the cure of the dysentery in India, and that he had given it in four recent cases of dysentery with success.

Probably this is the oil of the purging nuts, mentioned in Dale's Pharmacologia, which are got from the tree called *Lignum Moluccense*, *Pavana dictum*, *fructu avellanæ*, J. B. 1. 342; and *pinus Indica*, *nucleo purgante*, C. B. 492; and the *palma Christi Indica*, Tournefort, Mat. Méd.

Tournefort, in his *Materia Medica*, mentions different kinds of the *palma Christi*, and it should seem from his account, that these seeds or kernels of nuts were in his time used in substance, more than the oils expressed from them. He, after taking notice that the ancients drew an oil from these seeds, which powerfully purged and destroyed worms, as may be seen in Dioscorides, observes, that at this time, this oil is sometimes safely given to the quantity of an ounce, with an ounce and a half of rectified spirit of wine.

He then tells us, that the seeds of the common *palma Christi*, C. B. purge very strongly and powerfully, and expel hydropi-

cal humours; that three or four of the seeds well bruised, and mixed with a dram of cream of tartar, are sometimes given with a bit of bread to hydropical patients; and that these seeds are sometimes boiled in broth, to the quantity of six or ten grains.

That the expressed oil of the American palma Christi is given in the dropfy and cholic, to the quantity of an ounce. That its seeds bruised and swallowed in a small quantity of the fresh pulp of Cassia, purge to admiration; and that if from four to six seeds be bruised, and triturated in a marble mortar, with half a dram of cream of Tartar, while six ounces of water are added by little and little, it makes a purging emulsion.

That the seeds of the Indian palma Christi, called Grotiglia, so powerfully cut and evacuate gross viscous humours, that they may be preferred to the Coloquintida.

That the seeds of the palma Christi used in the American islands purge as powerfully, as the seeds of the other kinds, but a great deal more kindly and friendly; and that one of these seeds, being swallowed with a

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little butter, or else bruised and drunk in broth, or cut in small pieces, and swallowed down in a little bit of bread, is sufficient for one dose.

S E C T. IV.

Of Empyreumatic Oils.

HAVING considered the unctuous oils in their natural state, I come next to take a view of them, after they have been changed in their nature, by being distilled from the substances, which originally contained them, and go by the name of empyreumatic oils.

These empyreumatic oils, when first distilled, have a black colour, a fetid smell, and an acrid taste; and there is reason to believe, that they are new bodies produced by the force of fire, making a new arrangement of the oily principles contained in the substances from which they were distilled. They all have so much of the same appearance, and so many properties in common, that most people have imagined that they were all of the same nature; but Dr. *Vogel*,

in his *Institutiones Chemiæ*, § 534, &c. tells us, that not only the animal differ from the vegetable; but that each oil differs in its properties from the others, with respect to smell, taste, fluidity, colour, and texture, according to the different substances from which it is procured; but neither he, nor any other chymist whom I know of, has hitherto so particularly examined these oils, as to ascertain in what these differences consist. He tells us indeed, § 536, that all of them contain a volatile salt; but that this salt is not always of an alkaline nature, as is commonly imagined; but is sometimes of the acid kind, and sometimes a mixture of both acid and alkaline. In the empyreumatic oils of fats, of tartar, of fir, and of many other resinous woods, it is only acid; in the oil of hartshorn, and in the oil got from the blood, it is both alkaline and acid.

The empyreumatic oils themselves are so fetid and offensive, that they are now very seldom prescribed as medicines in London, and one only of them is retained in the Dispensatory; the *oleum cornu cervi*, which

was formerly much used, and was reckoned nervous and anodyne, and given in hysteric and hypochondriac complaints; it was an ingredient in the *pilulæ foetidæ* of many dispensatories. *Boerhaave*, and other physicians, used to order paralytic parts to be rubbed with these oils; but now other medicines, which are equally efficacious, but less nauseous, such as the *linimentum volatile*, &c. are made to supply their place.

If the *oleum cornu cervi*, or any other of these empyreumatic oils, be rectified by repeated distillations, it becomes perfectly clear and limpid; and acquires a subtle penetrating taste and smell, and has been called by the name of *oleum animale*, from its being prepared mostly from animal oils. In this state it has many of the properties of an æthereal oil. *Monf. Morveau* says, that if it be perfectly pure, it dissolves in part in water, and totally in spirit, and in vinegar; and inflames with the pure nitrous acid; that it is extremely volatile, and is the lightest liquor known next to æther; and that four ounces of oil of hartshorn yield only three drams of this fine oil.

This

This oil has been greatly recommended by Dr. *Hoffman* and Dr. *Boerhaave*, as a powerful antispasmodic, and nervous medicine, in hysteric, epileptic, and convulsive disorders: I have often used it in such cases, but think that its virtues have been greatly exaggerated.

It has been given from five drops to half a dram for a dose.

S E C T. V.

Of Essential Oils.

THE essential are the fragrant oils obtained by distillation or infusion from aromatic vegetables, which are soluble in alcohol; there are indeed some few animal substances, such as the civet, musk, castor, and ants, which yield a small quantity of a kind of essential oil, by being distilled in a large quantity with water; but those oils, Dr. *Vogel* says, differ much from the oils got from vegetables, and appear to be only a very fine fat rendered fluid by the

heat of the fire, and highly impregnated with spirituous particles; and that the singular property which oil of ants has of rising with rectified spirits in distillation, and not incorporating, but floating on the top of them, sufficiently confirms the truth of this assertion.

Dr. *Vogel* observes, that vegetable substances, in order to yield an essential oil, must abound both with a volatile spirit (which Boerhaave calls the spiritus rector), and with resinous principles; and that when they lose their spiritus rector, they become thick, and lose their fluidity, volatility, and smell; and hence that most chymists believe, that these properties depend upon this spirit.

The greater part of the essential oils are got by putting the flowers, seeds, plants, wood, or whatever the oil is to be drawn from, into a large alembic, or still, fitted with a proper apparatus; and after pouring a sufficient quantity of water over them, and macerating them for a proper time, by distilling so long as the water comes over impregnated with the essential oil. The oil which comes over with the
water,

water, either swims on its surface, or sinks to the bottom ; most of the essential oils got from the plants growing in this country, are specifically lighter than water ; but the greater part of those got from aromatic vegetables, growing under the torrid zone, are heavier.

One of the essential oils, the *oleum rosarum*, which is brought into this country, is got by infusing the flowers which contain it, in tepid water ; and perhaps others might be prepared in the same manner. This is the *essential oil of roses*, commonly called *otter of roses*, which is brought from the East Indies, and sold at a very high price. An officer who had been a number of years in the India service, assured me that the manner in which it is prepared is this : In certain places of the country of Bengal, they plant large fields with rose trees or bushes. When the roses are in flower, they fill a number of very large stone or glazed earthen vessels, or wooden casks, with the leaves of the flowers of the roses, very well picked, and freed from all seeds and stalks, and then pour pure spring water over them, so as to cover them, and rise some inches above their surface. They set the vessels in the

sun early in the morning at sun-rise, and let them stand till the evening; then they take them into the house, and set them out again early next morning, as before; and do this for four, five, six, or more days. At the end of the third or fourth day, a number of particles of a fine yellow oily matter appear floating on the surface; in a day or two these gather into a scum, which is the *otter*, or *essential oil* of the roses. So soon as this scum is observed, the operator takes it all up with great care on very fine cotton wrapt round pieces of stick, and squeezes it into a phial, which he immediately stops well. This operation he repeats every evening, while the roses continue to throw out any of this fine oil; and when they yield no more, he empties the vessels of the rose leaves, and fills them again with others which are fresh.

The essential oils have a fragrant smell, and are hot and fiery to the taste; and most of them so much so, as to be caustic in the mouth. Most of them are transparent, and of a fluid consistence; some few of them, such as the otter of roses, the oil of the aniseed, oil of mace, &c. though they become
fluid

fluid by heat, yet, upon being set in a cool place, congeal into a butyraceous-like substance.

The essential oils, by being kept, lose a great deal of their smell ; and the fluid ones acquire first a thick consistence, so as to resemble the oily substances called balsams ; and by being kept longer, become hard and brittle, and are converted into perfect resins. Hence we see that the balsams are only inspissated essential oils ; and the resins inspissated balsams ; and these different states, *Macquer* says, depend on the greater or less quantity of acid they contain ; for the more that is, the thicker consistence they have : thus he says that the essential oils, by stagnating, have not only a great deal of their fine volatile parts fly off, but attract likewise an acid from the air ; and hence they become thicker, and at first acquire the consistence of balsams, and afterwards of resins, by being longer kept ; and he says, as a proof of this being the case, that acids added to the essential oils, give them the consistence of balsams or of resins, in the same manner as if they had been exposed to the air. When essential oils have
become

become thick, and of the consistence of balsams or of resins, a great part of them may be again restored to a fluid state, and freed from the acid, with which it is entangled, by repeated distillations; for the fine essential oil, being more volatile than the acid, rises with a less degree of heat, and comes over into the receiver, while part of its acid remains behind in the retort, and coagulates the residuum into the consistence of a brittle resin.

Dr. *Vogel*, in his *Institutiones Chemiæ*, § 339, &c. mentions a very extraordinary thing which happens to the essential oils, by keeping them for 15 or 20 years; which is, that a great part of them is converted into a crystalline, pellucid, friable substance, which has the following properties: it has nearly the same taste and smell as the oil had originally, but more acid and pungent, and less fragrant, than before. It flames in the fire. It dissolves in spirit of wine, and in oleum tartari per deliquium, but not in water. It melts with heat, and assumes the form of an essential oil; but when cold, concretes again into the same solid saline form as before.

He

He says, that some chymists have classed this substance among the saline bodies; others have reckoned it to be a kind of camphor; but its properties are different from those of both; nor is it as yet known from whence, or in what manner this substance is generated, for chymists have neither been able to demonstrate the principles of which it has been composed, nor to make any artificial compound to resemble it.

The essential oils by distillation afford an acid phlegm, an oil, and an earthy residuum; and by repeated distillations they may be almost wholly changed into an acid phlegm, and an earth; for the honourable Mr. Boyle, by distilling some pounds of essential oil fifty repeated times, had at last only two ounces of the oil remaining, the rest of it having been converted into an acid water, and an earth.

The properties of these oils, with respect to other bodies, are;

They unite with the mineral acids, but not with the vegetable, and by that mixture become thicker, and in time acquire the consistence of resins or bitumens.

They

They excite a strong degree of heat, but occasion no flame with the concentrated vitriolic acid, though the mixture of this acid with the nitrous raises a flame with some of them, which the nitrous acid by itself was not capable of doing.

They likewise raise a strong degree of heat with the pure nitrous acid; and Dr. *Vogel* says, the following burst out into flames on mixture; viz. oil of turpentine, of cloves, of saffras, of cinnamon, of carvy, of juniper adulterated, of lavender, and of lemons, though none of the others produce this effect; but if an equal part of vitriolic acid be added to the nitrous, it will then exhibit the same phenomenon with the balsams of Mecca, copaiva, and of turpentine; and the balsam of Mecca, on flaming, will make an explosion like the firing of a cannon.

The greater part of them do not unite readily with the muriatic acid; a small quantity however of some of them are soluble by this acid; for *Monf. Morveau* mentions, that a *Monf. Achard* had dissolved four grains of the oil of saffras in an ounce of spirit of salt.

They

They do not unite with the vegetable acid, even in its concentrated state, at least the method of forming this artificial union is not hitherto known; which seems the more extraordinary, as we know that these oils contain an acid in their composition, and that vinegar contains an oily matter.

They unite with the pure fixed alkaline salts by proper management, and form a kind of soap called the Philosopher's, or Starkeus's soap.

They unite imperfectly with the volatile alkali; but by the intervention of spirit of wine, the union becomes complete, and they form the *spiritus volatilis oleosus*.

They dissolve readily in alcohol, in the dulcified spirits, and in æther; and they mix with both the expressed and empyreumatic oils.

They dissolve sulphur, especially when of a boiling heat, and form a very fetid and disagreeable balsam with it; and they take up more sulphur when they are hot, than they are able to keep suspended when they become cool; and the sulphur which they
let

let drop, concretes into a sort of crystalline form.

If the solution of sulphur in these oils be exposed to a considerable degree of heat in a close vessel, it bursts the vessel with a prodigious expansive force.

They have little effect upon metals in their metallic state, though they get a blue tinge from copper, owing probably to the acid in their composition.

They do not mix with pure water without the assistance of heat, though they impart something of their flavour to it; but by distillation they unite so far as to give the water both their taste and smell; and it is in this manner that the fragrant distilled waters of mint, cinnamon, balm, &c. commonly called the simple waters of the shops, are made. By triturating them in a glass mortar, with ten or twelve times their own weight of sugar, they form what is called an *elaeosaccharum*, which is miscible with water; and by mixing them together, a water equal every way in virtue and efficacy to the distilled waters, may be made; and it may be much
more

more strongly impregnated with the oil than these waters commonly are.

They are soluble in alcohol, and then mix easily with water; such solutions of essential oils are called *essences*, and a few drops of them impregnate a large quantity of water.

The essential oils have been used both for external application, and as internal remedies; but they are too hot and pungent to be used in either way, till they have been rendered milder by foreign mixture.

As they have an agreeable flavour, and give a brisk stimulus to the parts they are applied to, they have been added to oils, liniments, and ointments, which have been rubbed on, or applied to paralytic, or weak parts. And they have been mixed with cataplasms or plasters applied to the region of the stomach, in cases of nausea and vomiting, or of hiccup. And they have been dropt on cotton, and put into a hollow tooth to ease pain.

Given internally, after being rendered sufficiently mild, they prove warm, cordial, and refreshing remedies. They are generally prescribed

prescribed as cordials, with the view of keeping up the pulse, supporting the vis vitæ, and promoting the perspiration, and other watery excretions, in leucophlegmatic and paralytic cases, and in low fevers, and other cases where the vis vitæ is too low, and the patient is in danger of sinking.

They have been formerly looked upon as correctors of resinous purgative medicines; and with this view were added to both the colocynth pills of the late London Dispensatory, and to several purgative pills of the Edinburgh; but they certainly can have no such effect, and the only end they can serve, is to make these medicines sit easier on the stomach.

They are grateful and cordial, and have often been added to other medicines to warm and strengthen the stomach; they have been reckoned to be carminative and antispasmodic, and therefore have been used in flatulent, in hysteric, and in hypochondriacal cases, and in many of the disorders commonly called nervous.

The dose of the hotter kinds, is from one to four or five drops; and of the milder, from four
to

to twelve or more drops. As they are too hot remedies to be taken by themselves, they are commonly ordered to be rubbed with ten or twelve times their own weight of sugar, and then to be made into draughts or juleps with water; to which commonly a small portion of some spirit, or spirituous tincture is added; at other times, each dose, after being well rubbed with sugar, is mixed with an ounce, or an ounce and a half of almond emulsion; and sometimes with the yolk of an egg, an ounce or two of warm water, and a dram or more of some of the spirituous waters, or with wine; and these doses are repeated more or less frequently, according to the exigency of the case.

But although all the essential oils agree in their general virtues and properties, yet many of them have been imagined to possess peculiar ones, derived from the substances from which they have been got: I shall therefore take a view of the virtues which have been attributed to the different kinds of these substances.

They may be divided into the following classes.

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Y

I. Those

1. Those obtained from bitter vegetable substances. The oils got from them generally preserve their nauseous disagreeable taste, but lose in a great measure their corroborating qualities, and therefore they are now seldom called for; and all of them are thrown out of the London Pharmacopœia; in the last edition of which, two were still retained, the *oleum absynthii*, and the *oleum chamomeli*, which were sometimes ordered in worm cases. The oil of chamomile flowers, when fresh, has a beautiful blue colour; but the flowers only yield a small quantity of it; Cartheuser says, that a pound of the simple chamomile flowers seldom yield a scruple; and the same quantity of the Roman, half a dram.

2. The oils from the fetid class of plants, such as *the rue*, *the sabin*, *the sage*, &c. have been thought to promote the menstrual discharge, and to be serviceable in uterine disorders; though probably they are not more efficacious in such cases, than many of the other oils.

3. Those procured from many of the aromatic labiated class of plants, such as *hyssop*,
7
lavender,

lavender, *mint*, *peppermint*, *origanum*, *penny-royal*, *rosemary*, though they have been esteemed by many to have nearly the same virtues, yet different ones have been ascribed to them. *Hysop* and *penny-royal* have been called pectoral and uterine; *lavender* and *rosemary* cephalic; *mint*, *peppermint*, and *origanum* stomachic.

4. Those got from resinous plants, such as *oil of juniper* and of *turpentine*, have been esteemed to be powerfully diuretic and diaphoretic. The oil of turpentine was formerly employed both as a diuretic and diaphoretic medicine. The late Dr. *Cheyne*, of Bath, used to give a tea spoonful of an electuary, made with an ounce of honey, and two drams of turpentine, to patients labouring under the sciatica, and other rheumatic complaints; and to order them to wash it down with a very large draught of weak sack whey, or of thin warm water-gruel, which generally promoted a free perspiration, and acted as a strong diuretic medicine, and gave relief. Dr. *Home* of Edinburgh, in his Clinical Experiments, mentions his having ordered turpentine in this

form, to seven patients labouring under the sciatica, of whom five were cured by this remedy. Dr. *Stedman*, in the second volume of the *Edinburgh Medical Essays*, takes notice, that the ethereal oil of turpentine, mixed with honey, was much used by the lower class of people in his neighbourhood, as a cure for the sciatica, and other rheumatic complaints; and observes, that the dose at first ought to be small, and to be very gradually increased, to prevent the bad consequences which he saw happen to two women from an overdose. One, who took a dose, the quantity of which he could not determine, was seized with a pain in the kidneys, and a diabetes; and died dropical twenty-five days after taking it. The other, who took two drams of the oil in warm ale, was attacked with a strangury, and made bloody water, which was soon followed with a total suppression of urine, fever, thirst, and vomiting; but by the use of the warm bath, and drinking freely of almond emulsion, she got well. This oil has been recommended for stopping internal hæmorrhages; I have not seen it used but once

in such cases, and it produced no remarkable good effects: where there is much fever, I should imagine it to be rather too heating a medicine to be administered freely. The oil of juniper is often mixed with juleps, or with soap or squill pills, where a warm diuretic medicine is wanted in dropical and leucophlegmatic complaints.

5. The oils distilled from aromatic woods, are now all thrown out of the London Dispensatory; in the last edition of it, two of them were retained, the *oleum rhodii*, and *oleum sassafras*. The oil of the rhodium wood is now almost only used as a perfume; the oil of the sassafras has been recommended as a sudorific, and supposed to be of use in coughs and asthmas.

6. Those obtained from the seeds of plants, which grow in our northern climate, the *aneth*, or dill, *anise*, *carvi*, *cummins*, &c. are commonly reckoned to be carminative, antispasmodic, and pectoral, and much used in flatulencies; but whether they possess these virtues more than other essential oils, is much to be doubted.

7. Those got from the hot aromatic plants

which grow under the torrid zone, such as *cinnamon, nutmeg, cloves, &c.* are hot, fragrant, and aromatic, and are often used where a warm, cordial, aromatic medicine is wanted.

Formerly the number of these oils kept in the shops, was much greater than at present; and they were in greater esteem, though they are certainly very useful cordial remedies.

Pure water, or spirit, distilled with the substances which afford these oils, form the simple distilled and spirituous waters of the different dispensatories. The simple waters, as they are commonly called, are more used as pleasant vehicles for other medicines, and the spirituous ones as fragrant spirits, than for any virtue they are believed to acquire from the seeds or plants, &c. from which they have been distilled; though prejudice often makes us prescribe one in preference to another, on account of the virtues which have been attributed to each.

Camphora.

Camphor is a particular sort of solid concrete

crete substance, soluble in spirit, got from the wood and root of a tree growing in *Japan*, *Sumatra*, and in other parts of the East Indies, and called by Linnæus, the *Laurus-camphora*, or *camphorifera*. It is found in the interstices of the fibres of the timber and root, lodged in the same manner as gums and resins are in many trees in Europe; and it is got from them, either by picking it out with a needle, in form of small pieces or grains, when it is called *native camphor*, or *camphor in grains*; or by cutting and bruising the wood and roots; and subliming the camphor from it by the force of fire. The granulated camphor, or that collected with a needle; is held in such esteem by the Chinese, that they give ten times the price for a pound of it that they will give for a pound of the camphor after it has been sublimed; but the quantity gathered in this manner is extremely small; and, except some specimens which are sometimes brought home by way of curiosities by some of the officers in the service of the East India Company, it is never imported into Europe. Camphor is commonly brought to Europe in the rough

form in which it is procured from the wood, by sublimation, and is then purified and sublimed into the form of the cakes which are brought to market.

It was formerly looked upon as a resinous substance, but of late has been ranked among the essential oils by many chymists, though it has some properties different from any of them. When pure, it is solid, white, pellucid, and somewhat unctuous to the touch; it has a strong particular smell; is hot, bitterish, and pungent to the taste, and yet accompanied with a sense of cold; it is extremely volatile, and intirely soluble in alcohol; and is inflammable, and burns totally away without leaving any residuum. With respect to other bodies, it has the following properties:

It is said, by Messrs. *Macquer* and *Morveau*, to dissolve with the concentrated mineral acids, without any effervescence or heat, and to become fluid with them, and to put on the appearance of an oil, but separates from them on the addition of water.

It is not affected by either the fixed or volatile alkalies, in either their mild or caustic states.

It dissolves in both the expressed and distilled oils, and in alcohol. Rectified spirit of wine dissolves one half of its own weight of camphor, but almost the whole of it separates again from it on the addition of water.

It has been generally believed, that camphor is not soluble in water; but from experiments made within these two last years, it should appear that water is capable of dissolving and suspending a small portion of it; for if a piece of camphor be put into a very large bottle, nearly full of pure distilled water, and the bottle be well shaken for some time, the water acquires the smell and taste of camphor, and the camphor loses some grains of its weight; and the same thing happens, if a piece of camphor be put into distilled water, and be let remain there for some days, and the water be stirred about two or three times during that period; but what quantity of camphor water is capable of taking up and keeping suspended, has not been determined as yet.

By experiments made at Apothecaries Hall, it appeared that a pint (16 ounces)
of

of distilled water mixed smoothly with two drams of the camphorated spirit of wine, after being shook with it, and kept the camphor in that quantity of spirit (above seven grains) equally dissolved in it for twenty-four hours. Mr. Wilson, apothecary, in Henrietta-street, Covent-garden, told me, he had found that water took up and kept suspended a greater quantity of camphor, if the camphor was well triturated with double its own weight of sugar before it was mixed with the water.

The late Dr. Macbride of Dublin, in his *Experimental Essays* (Essay V. Exp. 6), says, that by boiling in a close vessel a dram of camphor, and as much quicklime, in six ounces of pure water, he dissolved the whole of the camphor; and that when he filtered the solution through paper, it was perfectly limpid, and never parted with the camphor; and he adds, that although he precipitated the lime in several ways, he had not hit upon any method of separating the camphor from the water.

Gums and mucilages, when mixed and triturated with camphor, render it capable
of

of being suspended in water, but do not dissolve it; and they soften its taste, and make it sit easier on the stomach.

Hitherto no good analysis has been made of camphor; for it is so volatile, that in attempting to distil it, it always rises in the form of camphor.—*Macquer* says, that Mr. *Hellot* made a kind of artificial camphor, from a yellow oil drawn from wine, and the acid vinous spirit, which comes over when the oleum dulce vitrioli is distilled; but he never could bring it to have all the properties of the true camphor.

Practitioners have not hitherto agreed whether camphor is a cooling or a heating medicine; some affirming it to be the one, others the other. From the taste, smell, and effects which I have seen it produce on those who took it as a medicine, I look upon it to be a cordial, stimulating substance; though perhaps not so much so, as some other substances which appear to be milder. It is allowed by all physicians to be a strong antiseptic, and to promote the circulation through the extreme vessels, and the different watery excretions, especially that by the skin;

skin; and it has been thought to calm the spirits, to allay spasms, and to procure sleep; and hence it has been much used in low, malignant, and in nervous fevers, where there has been delirium, and want of sleep, or a subfultus tendinum.

It has been reckoned by some physicians to be almost a specific in many convulsive disorders, especially in the chorea Sancti Viti, or St. Vitus's dance: I have often given it in this disorder with good effect; many recent cases yielding soon to its use, joined to that of the cold bath.

Dr. *Kinneir*, in the Philosophical Transactions, has recommended camphor as an effectual cure for madness, given in frequent repeated doses of half a dram each: and Dr. *Hoffman* says, that in recent gonorrhœas he has never found any medicine equal to it.

The dose of camphor is from one or two to twenty or more grains. It is a medicine which frequently does not sit easy on the stomach, and therefore is administered in various forms. It has been given dissolved in water, either by being first triturated with sugar, as in the julepum e camphora;

or

or by being triturated with one or two blanch-
ed sweet almonds, and a sufficient quantity of
water added by degrees, and then a dram or two
of the gum arabic mucilage and some sugar,
and a small quantity of any of the spiritu-
ous waters mixed with each dose of these
solutions. Dr. *Fothergill*, in the Medical
Observations and Inquiries, vol. 1, says,
that camphor mixed with juleps, by means
of a thick gum arabic mucilage, becomes
more agreeable, and does not irritate the
stomach, nor cause so much uneasiness as
when either given in pills, or in boluses,
or in the common julepum e camphora;
and that it may be given in larger and oftener
repeated doses, where needful. Dr. *Huxham*,
in his Essay on Fevers, has recommended
the using vinegar instead of water, in
making camphorated draughts and juleps,
because it agrees better with the stomach,
and is at the same time an excellent remedy
in putrid fevers. It is frequently given in
pills made by triturating it first well with
blanched almond, or powder of gum arabic,
and then adding warm cordial, or such other
medicines

medicines as are indicated by the symptoms for which it is ordered.

Joined to opium it proves diuretic and diaphoretic. *Geoffroy* recommends the following as a good remedy for promoting sweat. Take of camphor fifteen grains, of oil of cinnamon three drops, and make them up into a bolus with conserve of rosemary.

Camphor has been thought to correct the bad qualities of the cantharides, when mixed with them in powder, in the proportion of five or six grains of camphor, to one of cantharides; and by this mixture has been said to become a powerful remedy for the cure of the chin-cough, and of bad fevers; but the bad effects which have sometimes followed the internal use of the cantharides, have always deterred me from using them in substance.

Camphor is much used as an external remedy; mixed with liniments and ointments, it proves an excellent discutient and anodyne application. It is often rubbed, when dissolved in unctuous substances, upon swellings and tumors, where there is not much inflammation, and on parts afflicted with

with chronic, rheumatic, and other pains; joined to the mercurial ointment it increases its efficacy as a discutient.

Dissolved in spirit of wine it is applied to swelled and bruised parts; and is frequently sprinkled on flannels, which have been dipped in fomentations, before their application to diseased parts.

C H A P. X.

S E C T. I.

Of Native Balsams.

I HAVE already observed that the essential oils, by being kept, become thicker, and acquire the consistence of balsams; and in every respect agree with the substances got from plants and trees, which go by the name of balsams, having the same properties, and yielding the same principles, when subjected to a chymical analysis;

sis; for there first comes over an acid watery phlegm, and a fine essential oil; as the distillation goes on, the oil becomes thicker, and the phlegm more acid, till there remains only in the retort a hard resinous substance, commonly called colophone; and if this colophone be urged with a strong fire, the greater part of it comes over in form of a very thick oil, almost of the consistence of turpentine, along with some very acid red phlegm.

The thick matter left in retorts after the distillation of balsams and turpentine, was originally called Colophon, from a town of that name, situated in Ionia, in Asia Minor, from whence formerly resin used to be imported into Europe, as we learn from Dioscorides.

Macquer alledges the cause of these appearances to be this; that the fine essential oil and watery phlegm being most volatile, come over first, so that the acid in what remains becomes gradually more concentrated, and proportionally in greater quantity, as the distillation advances, and the residuum becomes thicker.

The

The balsams dissolve readily in alcohol, and most of them mix with oils.

They are not miscible with pure water, though some of them, when shaken in it, give it a smell; and they may be united to it by means of proper menstrua, and right management. Thus beating them well with the yolk of an egg, or rubbing them in a mortar with powder of gum arabic, or with a thick mucilage, or with blanch'd almonds, or triturating them with sugar, or with saccharine mucilaginous substances, such as extract of liquorice, &c. makes them lose a great deal of their viscid-ity and toughness, and renders them miscible with water, and with our juices; at the same time that it lessens considerably their stimulating heating quality; and for these reasons, these balsams, when prescribed as internal medicines, are commonly ordered to be mixed with some of these substances.

They may be dissolved in water by the assistance of caustic fixt alkaline salt or of quicklime; and Dr. Macbride says that a clear and limpid solution of them may be

obtained, by boiling them in water with an equal quantity of quicklime, and then filtering the solution through paper.

They have been much used as external applications for cleaning and healing sores and ulcers ; but as they are generally too acrid and viscid to be applied by themselves, they have been commonly beat down with the yolk of an egg, or made up into liniments and ointments with some unctuous oil, before they have been applied.

These balsams, when properly dissolved, enter the blood, and prove cordial, stimulating, and antiseptic remedies ; and are believed to thicken and incrassate the humours ; and therefore they have been often prescribed in cases of internal ulcers, as healing detergent medicines ; but however much they may have been praised by most writers on the materia medica, I think that they ought never to be administered where there is much heat and fever ; or where pus is confined, and has no free outlet from the body ; for then I have almost always observed that they did mischief ; though in cases of internal ulcers, where

where there was neither much heat nor fever, and the matter was discharged freely, I have seen them be of the greatest service, by incrassating the humours, and bringing about a discharge of good laudable pus, to heal the sores.

They have been called pectoral, and used in ulcerations of the lungs, in coughs, and in the hemoptoe; but wherever I have seen them administered, in such cases, they have increased the heat and fever, and made every symptom worse.

They have been much celebrated for their effects in stopping gleans, and lessening the fluor albus. They promote the discharge by urine; and likewise by the skin, if assisted by warm drinks, and proper management; and some of them when taken in large doses prove laxative.

The common dose of these balsams is from five grains to a scruple, though they are sometimes given in a much larger quantity.

S E C T. II.

Of particular Balsams.

THOSE in most frequent use are, 1. *The Balsam of Canada.* 2. *The Balsam Copaiva.* 3. *The Balsam of Mecca,* or *Opobalsamum.* 4. *The Balsam of Peru.* 5. *The Balsam of Tolu.* 6. *Turpentine.* To which may be added, 7. The empyreumatic balsamic substance called *Tar.*

1. *Balsamum Canadense.*

The Canada balsam is a clear, transparent, light amber-coloured, resinous juice, or balsam, which has an agreeable smell, and a warm pungent taste, and is brought to us from the province of Canada, in North America. It is the produce of the *Abies Canadensis*, called by Linnæus *Pinus Balsamea*, and in English, the Virginian or Canada fir-tree. It is of the nature of the balsamum copaiva, but more pleasant, and is used for the same purposes as other balsams. Dr. Huxham
says

says he found it to answer in all the cases in which he used to prescribe the copaiva, and that he thought it preferable to it.

2. *Balsamum Copaiva.*

The copaiva balsam is got from a tree growing in the Brasils, and in other parts of South America, called by Linnæus *Copaifera officinalis*, the white American balsam-tree. It is clear and transparent, and of a pale yellowish colour; it has a particular, but not unpleasant smell, and a bitterish pungent taste, and is often adulterated. It is much used in gonorrhœas, gleets, and the fluor albus, has been thought to be particularly useful for bringing the matter to a due consistence, and for stopping the discharge; and it has been given in cases of sores and ulcers, where the matter has been too thin, and the general habit bad. It has been looked upon as a powerful diuretic, and been administered to promote the discharge by urine. The following singular case occurred a few years ago: a gentleman, after a gonorrhœa, had a tumor larger than half a pigeon's egg, come on the corpus cavernosum penis, to-

wards the anus : mercurials, decoctions, and various other remedies were taken, and various external applications used, but without effect : at last, by the advice of a physician, the patient took a dose of balsamum copaiva three times a day, and the tumor went away, and he got well. Whether the medicines which the gentleman had before taken had removed the cause of the complaint, or whether the balsamum copaiva had contributed to the discussion of the tumor, is what is not easy to determine.

3. *Balsamum Meccæ, seu Opobalsamum.*

THE *Balsam of Mecca*, or of Gilead, called likewise *Opobalsamum*, is the most fragrant and pleasant of any of the balsams. The shrub which yields it is the *Balsamum Syriacum*, Rutæ folio B. P. called by Linnæus *Amyris Opobalsamum*. The true balsam tree grows wild in Arabia Felix, near to Mecca, which is situated about a day's journey from the Red Sea, on the Asiatic side. It has a yellowish or greenish yellow colour, a warm bitterish aromatic taste, and an acidulous fragrant smell. It has long been held
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in great esteem. The Turks, who are in possession of the country in which it grows, value it much, and set such a high price upon it, that it is adulterated when it comes into the hands of the dealers, so that it is very difficult to get genuine specimens of it, and therefore it is very seldom used in this country; it has been recommended in great variety of complaints, but now it is generally believed that the Canada and copaiva balsams are equally efficacious, and will answer every purpose for which it can be used. Dr. Alston says, that the surest mark of this balsam being pure and unadulterated, is, its spreading quickly on the surface of water when dropt into it; and that if a single drop of it is let fall into a large saucer full of water, it immediately spreads all over its surface, and, as it were, dissolves and disappears; but in half an hour or so, it becomes a transparent pellicle, covering the whole surface, and may be taken up with a pin, having lost both its fluidity and colour, and become white and soft, cohering, and communicating its smell and taste to the water. This test, he says, all the bal-

sam he saw in Holland bore, though it is rare to get any from London that answers it.

4. *Balsamum Peruvianum.*

This balsam, which is of a dark brown, or reddish black colour, is got from a shrub growing in Peru, which has been called by some botanists the *arbor balsami Indici*, and by Linnæus *myroxylon Peruiferum*, the natural balsam-tree of Peru. It has a warm, subacrid, and aromatic taste, and a fragrant sweet-smell. It is heavier than water, and sinks to the bottom when dropt into it.

It does not unite with expressed oils, animal fat, nor wax; but by long trituration, it may be formed into an emulsion with water, by means of almonds and sugar, or powder of gum arabic. Alkaline lixivia dissolve a great part of it, and rectified spirit the whole.

It is a warm aromatic medicine, hotter than the copaiva, and has been employed for the same purposes as it.

There is a white sort of balsam of Peru, which is more fragrant than the one I have
just

just mentioned. Dr. Alston says, that this white kind, which is more fluid than the other, is got by incision from the same tree, and is rarely to be met with in Europe.

5. *Balsamum Tolatanum.*

This balsam is the produce of a small tree, of the pine kind, called by Linnæus *Toluifera balsamum*, the balsam-tree of Tolu; which grows in a district called Tolu by the Indians, situated between Carthagena and the province of Nombres de Dios, in the north part of South America. The balsam is commonly brought home in a solid form, in the shells of large nuts. When it is first imported it is of a softish consistence, but grows friable and hard like a resin by keeping; it is of a yellowish brown colour, inclining to red, has a soft aromatic resinous taste, and a fragrant smell, somewhat like to that of lemons.

It dissolves intirely in spirit of wine, but is not soluble in water.

This is the mildest and pleasantest of all the balsams, and generally esteemed to be the least stimulating; it has the same general

ral virtues as the other balsams, and been used for the same purposes; and on account of the belief of its being less stimulating and heating, it has been more employed as a corroborating medicine; and formerly it was much prescribed in the fluor albus, old gleet, and feminal weakneses.

Rubbed down with five or six times its own weight of sugar, or dissolved with the yolk of an egg, and made up into a draught, it is given in substance from five grains to a scruple, or more.

In many pharmacopœias there is a *tinctura Tolutana* ordered, which is prepared by dissolving an ounce and a half of this balsam in a pint (sixteen ounces) of rectified spirits of wine, and possesses all the virtues of the balsam itself; it may be given to the quantity of a tea-spoonful or two in syrup, or mixed with any proper saponaceous vehicle.

In the Edinburgh Pharmacopœia, there is a *syrupus balsamicus*, which is ordered to be made by mixing an ounce of the *tinctura Tolutana* with two pounds (thirty-two ounces) of syrup of sugar, just after it is made, and
before

before it becomes cool ; the tincture is directed to be poured slowly into the syrup, and the syrup to be kept stirring about during the time, and for a few minutes afterwards. This is a pleasant agreeable syrup, which has the full flavour of the balsam. Dr. Lewis, in his notes to his translation of the Edinburgh Dispensatory of 1744, says, that a greater proportion of the balsam is kept suspended in the syrup, than can be effected by any other method, and the taste preserved by the evaporation of the spirit ; and that this is the most frugal way of managing an article almost always too dear for the purposes of a common syrup. The method of making the *syrupus balsamicus*, in the last London Pharmacopoeia, was much more expensive, and not near so good a syrup. Eight ounces of the balsam of Tolu were ordered to be boiled in three pints of water for two or three hours, and then the strained liquor to be made into a syrup with sugar : by this method the balsam of Tolu, which is not soluble in water, only communicated to it its flavour, and perhaps a little loose acid salt which it might contain ;

contain ; and eight ounces of the balsam of Tolu were employed to make about five pounds, (of sixteen ounces each) of syrup, which contained a very small portion indeed of it. By the process of the Edinburgh Pharmacopœia, two ounces and a half of the tincture, which contain 113 grains (of one dram, two scruples, and five grains) of the balsam are employed to make the same quantity of syrup, on which account many of the dispensers of medicine in London always employed the syrup made according to the receipt of the Edinburgh, instead of that of the London Pharmacopœia.

6. *Terebinthina.*

There are different sorts of turpentine, got from different trees, which have been employed in medicine ; they are all nearly of the same nature, and possess the same general properties.

The four following are those which have been most in use :

1. The *Common.* 2. The *Chian.* 3. The *Venice.* And 4. the *Straßburgh.*

1. The *Terebinthina communis*, or common

mon turpentine. Dr. Alston says, that it is or may be got from a variety of firs and pines, wherever they are common; but the tree which is said to yield most of it, is the wild or mountain pine, called by Linnæus *pinus sylvestris*. It is opake and whitish, and of the consistence of old honey, and has a bitter, resinous, disagreeable taste.

2. The *Terebinthina Chia*, vel vera, the Chian or true turpentine. This is got from a tree that is frequent in the islands of Chio, and Cyprus; in the Archipelago, and said to grow likewise in the south of France, Spain, and Italy, and to flower in April; it is called by Tournefort, the *terebinthus vulgaris*; the turpentine tree. This turpentine is generally of the consistence of honey, is clear, and almost transparent, of a white colour, inclining to green or yellow; when genuine it is the most fragrant and agreeable of any of the turpentines. It is now but little used in this country, on the account of its being difficult to procure it genuine. Tournefort mentions, in the first volume of his Voyages, that the peasants in the island of Chio make incisions with a hatchet across the

the trunks of the large trees, whence the turpentine runs out, and falls on flat stones laid under them to receive it.

3. The *Terebinthina Veneta*, or Venice turpentine. This is got from the larch-tree, the *pinus larix* of Linnæus. When genuine it is of the consistence of new honey, very viscous, of a yellow colour, of a warm bitter resinous taste, and fragrant smell, and, Dr. Alston says, flows from a tree wounded or bored to the heart. Formerly, when the trade from this country to Venice was very brisk, it was much used here; but now very little of it is imported; and Miller, in his Botany, says that what goes now under its name is generally brought from New England, and that it is uncertain whether it is produced from the fir, or pine, or spruce trees, or from them all; and Savary, in his Dictionary, says, that turpentine which runs from incisions made in larch-trees, firs, or pines, in the province of Forez, in France, passes at Paris for the Venice turpentine.

4. The *Terebinthina argentoratensis*, seu *abietina*, Strasburgh turpentine, is the product

duct of the *abies officinarum*, or *abies taxifolius* Raii, the silver or yew-leaved fir-tree. This turpentine is of a thinner consistence, clearer, and of a paler colour than the Venice turpentine; it has a bitterish taste, and a pleasant smell, a little like that of lemon-peel. It is suspected that the New-England turpentine, strained and purified, is often sold for it in London.

The turpentines are much used for making ointments and plasters; and a small quantity of them dissolved in the yolk of an egg, and mixed with watery and oily liquors, is sometimes thrown up by way of clyster, in cases where there is a stoppage of urine; and in nephritic cases, in which form they sometimes act as powerful diuretics.

The finer kinds of turpentine have been often used as internal remedies, and given as diuretics, from a few drops, to half a dram, or more, after being divided by means of the yolk of an egg, sugar, honey, blanched almonds, or some other saponaceous substance, in order to promote the secretion of urine, in cases of dropsy, stoppages of urine, &c. to forward the healing of sores, and of ulcers, and to
put

put a stop to the fluor albus, gleets, and other inordinate discharges.

7. *Pix liquida.*

The *pix liquida*, or tar, is a half-burnt balsam, or turpentine, extracted from fir, or other resinous woods, by fire, so managed as to accomplish a kind of distillation per descensum. The product of this distillation, the tar, differs from the turpentine in being rendered empyreumatic, and being in part decomposed, and containing a portion of the saline and other juices of the tree united to it by the force of fire.

It is much milder than the turpentine, and has been believed to be a good pectoral remedy in the asthma, and in old coughs; in many dispensatories it is ordered to be made up into pills with elecampane root reduced to a fine powder, in order that it may be administered in this form in the above-mentioned complaints. About forty years ago, a *tar-water* made by mixing well a quart of tar with a gallon of water, and letting it stand for three or four days, till the tar had subsided, and then pouring off
the

the clear water, after the scum had been taken off, was esteemed to be a most efficacious remedy in most disorders the human body is subject to, when taken the length of a pint in the day, at two or four doses. Being employed for almost every disorder, it soon fell into disrepute; though it is still looked upon as a good medicine in some particular cases. It has a sourish taste, and contains a quantity of the distilled acid of the fir, from which the tar was made; united probably with a very small portion of the empyreumatic oil. Its general operation is that of a diuretic, it has acted as a sudorific, and sometimes proved laxative. It is ordered in the same disorders as the tar itself; it has been given to correct a putrid acrimony in the blood; and it has been of service in some foul sores, and in impetiginous and leprous cases, when taken as a medicine, and used at the same time as a wash or as a bath.

C H A P. XI.

S E C T. I.

O F R E S I N S.

HAVING considered balsams, I come next to take a view of those substances called Resins, which are only inspissated balsams, for all the balsams, by being kept and exposed to the air, grow hard, and become resins; and the resins, on being distilled, yield entirely the same principles as the balsams; to wit, an acid phlegm, and an oil, which grows thicker as the distillation advances; and there remains behind a thick resinous substance, the greater part of which may be made, by the force of fire, to come over in the form of a thick oil, and an acid phlegm.

The resins are soluble in alcohol, and in oils; but not in water, unless assisted by the caustic alkali, or by quicklime and heat; though they may be mixed with water
into

into a sort of emulsion, by triturating them with gum or gummous mucilage, or with saccharine or saponaceous substances.

Most of them are only made use of for making ointments and plasters.

Such of them as are used as internal remedies, being insoluble by the juices of our bodies, while they remain in the state of pure resins, are for that reason either dissolved into tinctures, or mixed with saponaceous resolving substances, before they are administered as medicines. The doses ordered of them, have been from a few grains to a scruple.

S E C T. II.

Of particular Resins.

THE pure resinous substances which are retained in most dispensatories are the following, some of which, from their appearance, have been called gums, though they have no title to that name, being pure resins, and containing no gummous parts which are soluble in water.

1. *Resina flava*. 2. *Resina nigra*. 3. *Pix arida*. 4. *Pix Burgundica*. 5. *Thus*. 6. *Ambra liquida*. 7. *Caranna*. 8. and 9. *Copal* and *Anime*. 10. *Elemi*. 11. *Labdanum*. 12. *Mastiche*. 13. *Sanguis Draconis*. 14. *Styrax Calamita*. 15. *Tacamahaca*. 16. *Benzoin*. Of these the five first, the *resina flava*, the *resina nigra*, the *pix arida*, the *pix Burgundica*, and the *thus*, as they are now sold in the shops, should seem to be different preparations from the turpentine; and are all only used for the preparation of plaisters and ointments.

1. The *Resina flava*, yellow resin, is the hard resinous substance which remains with the water in the retort, after the æthereal oil has been distilled from the turpentine.

2. The *Resina nigra*, is the black resinous matter which remains in the retort, after the distillation of the turpentine has been carried so far, as to force over part of the yellow thick oil, which rises after the æthereal oil has all come over; or it may be made by distilling the yellow resin itself, and drawing off a quantity of that thick yellow oil,
which

which formerly went by the name of balsam of sulphur. This resin is very friable, and of a black colour; but when looked through, is transparent and reddish, which distinguishes it from the *pix sicca*, that is opaque. It has the same smell and taste as the yellow resin.

3. *Pix sicca*, is the tar evaporated till it acquire the consistence of a resin.

4. *Pix Burgundica*, Burgundy pitch, is a softer kind of the yellow resin; it is of a yellowish brown colour, and of the taste and smell of common turpentine. It seems to be only the turpentine hardened by drawing off part of the essential oil, or by coction. Mr. Geoffroy alledges, that it is the white resin, softened by a mixture of common turpentine, and of its essential oil.

5. *Thus*, or common frankincense, when genuine, is the native resin which flows from the wild pine; but the resin of pitch, and of resiniferous trees, is often substituted in its place; and most, if not all that is sold for it in London, is suspected to be only the common yellow resin, mixed with a small pittance of oils, or other

resins, to give it the smell and appearance of the genuine.

6. *Ambra liquida.*

Ambra liquida, liquid amber, is of the consistence of Venice turpentine, but of a more reddish yellow colour; of a hot aromatic taste, and a fragrant smell. It is brought from the West Indies, and is got from a large tree growing in New Spain, and other parts of America, which has been called 'by Linnæus *liquidambra styraciflua*; though Dr. Alston seems to think that the species of this tree has not been hitherto ascertained. At present it is very difficult to be got genuine; it is used by the perfumers, but is not in the list of simples in the pharmacopœia.

7. *Caranna.*

Caranna is a resin of the consistence of pitch; it is of a dark brown or blackish colour, has a viscous resinous taste, and a fragrant smell, especially while burning: it is brought from New Spain in little cakes covered with leaves. It is said to be got

from a large tree called *caranna monardi* by Caspar Bauhinus in his Pinax. Geoffroy says that it yields a fine essential oil by distillation. It is difficult to be got genuine, and is now never called for as a medicine in this part of the world.

8. 9. *Copal* and *Anime*.

G. Copal is a white, shining, somewhat transparent resin, which has a fragrant smell; but Monardus says, not so much as the *G. Anime*, with which it is often confounded. They are both brought from South America; and hitherto have been more used in manufactures than medicine. *Piso* observes that copal is a general name used by the Indians in South America, which may account for the confusion of the names of these two substances, the history of which is not sufficiently known.

10. *Elemi*.

Elemi Resina, improperly called gum elemi, or gum lemon, is a softish, semi-pellucid resin, of a yellowish white colour, inclining to green; of a resinous bitterish

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taste,

taste, and fragrant smell. It is got from a tree growing in the Brazils, and other parts of South America, called by the people of the Brazils *icicariba*, and by Linnæus *amyris elemifera*, and in English the gum elemi tree. The gum elemi is almost entirely made up of resinous parts, and contains a very small portion of gummous. *Neuman*, in analysing this resin, got from a pound of it ten drams of an essential oil, and two drams, two scruples of gummous matter, and the rest was a hard resinous substance. It dissolves in spirit by the assistance of heat, and forms a light yellow-coloured pleasant smelling tincture; which has a warm, balsamic, bitterish taste. It imparts its flavour and taste to water, and gives the water only a very slight yellowish colour. *Savary* mentions that it is difficult to get it genuine, and that three other different sorts of resins have been sold for it.

It is at present almost only used in this country as an ingredient in ointments and plasters, though *Dr. Lewis*, in his New Dispensatory, says, that it is certainly preferable,

ferable for internal purposes, to some others which are held in great esteem.

II. *Ladanum*.

Ladanum or *Labdanum*. *Ladanum* is a dark purplish brown rosin, of an oily, warm, bitterish taste, and a very agreeable fragrant smell; it is brought home in twisted rolls, some larger, some smaller, mixed with sand and earth. It is gathered from the leaves of a shrub, growing in the island of Candia (formerly Crete), and in other islands of the Archipelago, which has been called *cistus ladanifera*, and *cistus ledon Cretense*, and by Linnæus *cistus Creticus*, in English the true ladaniferous shrub, *cistus*, or holly-rose. It grows on dry sandy hills, and its leaves sweat out this odoriferous resin, in the hot summer months, at first clear, liquid, and shining, but soon sullied by the dust of the soil; it is gathered from them by the inhabitants, who are suspected to mix it with the black sand and dust of the soil; for *Geoffroy*, on analysing this resin, found that two pounds of it contained twenty-four ounces of sand; so that a pound of sixteen ounces,

ounces, only contains four ounces, or one fourth part of pure ladanum. By *Cartbeuser's* account, the ladanum should seem to contain gummous as well as resinous parts, and perhaps ought to have been ranked among the gum resins; for he says that an ounce of ladanum, which seems pretty pure, commonly yields five or six drams to spirit, and one to water.

Dr. *Alston* says, that if pure, it agrees with the balsam of Peru; it has been given in the same cases as the other balsams and resins, but at present it is only used for the preparation of ointments and plasters.

12. *Mastiche.*

Mastiche or *Mastix*. Mastic is a solid, brittle, semi-pellucid, yellowish white resin, in small, and commonly roundish drops, softening in the mouth, without adhering to the teeth; of a subacid, agreeable, resinous taste, and fragrant smell; which flows from incisions made in the trunk, and larger branches of a tree called the *lentiscus vulgaris*, and by Linnæus the *pistacea lentiscus*, and in English the mastic tree. It grows plentifully

fully in the island of Chio, in the Archipelago, from whence the best resin is brought; and a coarser kind is brought from Italy, Sicily, and Portugal. It is not soluble in water, though it communicates its flavour to it; but it dissolves entirely in rectified spirit, and forms a grateful smelling warm balsamic tincture.

Mastic is at present but little used as an internal medicine, though formerly it was given as a stomachic, and to restrain, and put a stop to the fluor albus, and gleet; it was looked upon as an astringent and strengthening remedy, and given in the diarrhoea and dysentery; and, like many other of the balsams and resins, has been recommended as a pectoral in coughs, spitting of blood, &c. but experience has shewn, that such resinous substances are of too heating a nature to be used in such complaints. Upon the whole we may say, that it is a mild solid balsam, which may be used where a medicine of this kind may be indicated. It got its name from being formerly much used as a masticatory.

13. *Sanguis Draconis.*

Sanguis Draconis, Dragon's blood, is a solid resinous substance, in drops or masses, of a dark red colour, which have little taste or smell, and when reduced to a fine powder becomes of a bright crimson. It is not soluble in water, but is entirely dissolved in rectified spirit, when it acquires a small degree of pungency and warmth.

We do not as yet know the tree or plant which affords the genuine sort of this resinous substance; but a red resin, under the name of dragon's blood, is brought home from the East Indies, from the Levant, from the coast of Africa, and from the Western Islands; but whether it is all collected from the same, or different sorts of plants, is not hitherto known; it is generally suspected that they are different.

This resin has been long looked upon as an astringent; but it certainly has no more title to this appellation, than any other of the resins; though it has been generally ordered as such in gleets, in uterine hæmorrhages,

rhages, in the fluor albus, &c. but then it has been generally joined to alum, as in the *pulvis stypticus* of the late Edinburgh Dispensatory, and in the powder recommended by Dr. Mead, in his *Monita Medica*, for an immoderate flow of the menses.

14. *Styrax*.

Storax, vel *Styrax Calamita*. Storax is a softish solid resin, made up of drops or grains, of a yellowish or reddish colour; of a soft resinous, or aromatic taste, and most fragrant smell, somewhat resembling that of balsam of Peru. It is commonly divided into two sorts, the styrax called calamita, from having been brought in reeds; and the styrax vulgaris; but Geoffroy says that they are both the product of the same tree, the *styrax folio mali cotonis*, B. P. called by Linnæus *styrax officinalis*, storax-tree, which grows in Syria, and other eastern countries; and likewise in Crete, Italy, and other places.

The storax, as it is brought home, is mixed with a great deal of saw-dust, or other such stuff, from which it must be freed,

freed, before it can be used as a medicine. It is generally looked upon as a resinous substance, which is perfectly soluble in spirit; but *Cartheuser* says, that *Neuman* affirms, that one fourth part of it is made up of gummous matter. *Dr. Alston* observes, that *Codrus* had affirmed that a pound of storax will not afford an ounce of resin; but he found that spirit of wine dissolved near one half of it, without heat. *Dr. Lewis*, in his *New Dispensatory*, says, that rectified spirit dissolves storax, leaving the wood behind; nor does this tincture lose considerably of its valuable parts in being inspissated to a solid consistence; whilst aqueous liquors elevate almost all the fragrance of the storax: from these accounts it should appear, that it has not hitherto been determined what quantity of gum and of resin it contains. If it contains such a portion of gummous matter as *Dr. Neuman* alledges, then, in order to preserve all its virtues when it is purified, it ought first to be boiled in water, and the water be evaporated, after being filtered; and after boiling, it should be digested in spirit, and the watery and spirituous extracts
be

be mixed while yet in a fluid state, before the evaporation is completed.

Dr. *Lewis* says, that storax is one of the most agreeable of the odoriferous resins, and may be exhibited to great advantage, in languors and debilities of the nervous system; at present it is seldom used as an internal remedy, and the preparations in which it was an ingredient, are now thrown out of the pharmacopœia.

15. *Tacamahaca*.

Tacamahaca is a solid dry resin, composed of whitish, yellowish brown, or yellowish green lumps. It has a bitterish aromatic taste, and fragrant smell like mastic. It is brought from America, and is the produce of a tree called by *J. Bauhinus* *tacamahaca populus similis*, and by *Linnæus* *populus balsamifera*. It is not used medicinally in this country at present.

16. *Benzoe*.

Benzoinum, or *Benzoe*, or *Asa dulcis*. Benzoin or Benjamin is a hard brittle resin, of a light brown colour, but marbled with intermixed

termixed whitish or yellowish drops, of a soft sub-acid resinous taste, and very fragrant sweet smell; it is got from the styrax benzoin tree, which grows in the island of Sumatra, and of which Dr. Jonas Dryander has lately given a botanical description, in the 31st Art. of the 77th volume of the Philosophical Transactions.

Cartheuser says that the benzoin dissolves entirely in spirit; but that water assisted by heat has very little effect upon it, except getting a flavour and a slight taste from it.

This is a particular sort of concrete juice, which yields by distillation principles different from most other resins; for there first rises a solid yellow substance, in the form of flowers, which fills up the neck of the retort, and must be taken out when once it is all risen, before we can go on with the distillation; after this, if the remaining part be mixed with sand, and distilled again, we get first a light oil of a pleasant smell, but in small quantity; a little of an acid liquor, and a great deal of a red thick oil, which concretes almost like butter; and there remains in the retort a black mass or caput mortuum,

mortuum, which contains more earth than the residuum of most other resins. *Cartheuser* says, that a pound of benzoin yields about two ounces of flowers, which must afterwards be purified; about nine drams of oil, partly essential, partly empyreumatic; and a quantity of an acid liquor. *Geoffroy* tells us, that a pound of benzoin yields from an ounce and a half to two ounces of flowers, by sublimation; and an ounce only by boiling it in water.

Mr. Scheele, in his *Experimental Essays*, mentions, that he obtained between nine and ten drams of pure flowers from a pound of benzoin; by distillation; but that he got from ten to fourteen drams, by boiling the same quantity of benzoin reduced to a fine powder, in water, which had four ounces of quicklime mixed with it; and then precipitating the flowers, which had been dissolved in the water, by means of the muriatic acid.

The benzoin itself is rarely used at present, though, like most other strong-smelling resins, it was formerly employed as a pectoral, in coughs, asthmas, and con-

sumptions; and was recommended as an useful diaphoretic in head-achs, and other diseases of the head, where a strong-smelling, cordial, resinous substance was indicated.

The *flowers of benzoin* are now known to be a particular kind of acid salt; they dissolve in water by the assistance of heat; but concrete again in form of irregular crystals at the bottom of the vessel, when the water becomes cold; and hence by throwing them, when powdered, into water which is boiling, they will be dissolved, and may be got pure from the water, when it becomes cold; or if a sufficient quantity of sugar be added to the boiling water in which the flowers are dissolved, we get an elegant balsamic syrup, capable of suspending the flowers when the water becomes cold, which has been held in great esteem as a pectoral and sudorific medicine by many people. They form the following neutral salts with the three alkalies:

<i>Acid.</i>	<i>Alkali.</i>	<i>Neutral Salt.</i>
Acid of Benzoin	vegetable	Alkali vegetabile benzoinatum.
	mineral	Alkali minerale benzoinatum.
	volatile	Alkali volatile benzoinatum.

But

But none of these neutral salts have hitherto been used as medicines, that ever I have heard of.

The flowers dissolve in spirit; and such tinctures have been recommended as cordial, diuretic, and diaphoretic remedies.

The flowers are not often used, though I have seen them ordered to be rubbed down with sugar, and taken to the quantity of ten grains, two or three times in the day, in cases of slight feverish disorders, attended with cough. They have been much recommended as powerful diuretic and diaphoretic medicines, and have been given from five grains to half a dram for a dose.

C H A P. XII.

S E C T. I.

OF GUM-RESINS.

THE next class of substances which I shall consider are the gum-resins, composed of a mixture of gummous and

resinous parts. They were originally the lactescent juices of plants, made up of their essential, oily, and mucilaginous, or gummy and watery parts, which, by being dried either by natural or artificial heat, became gum-resins; the gummous part of which is soluble in water, but not in spirit; and the resinous part in spirit, but not in water; though most of them contain such a quantity of gummous matter, that if they be reduced to a powder, and then triturated in a mortar, while water is gradually added to them, the gummous part will be dissolved, and the resinous divided and suspended in the water, by means of the gum, in form of a milky liquor or emulsion.

As these gum-resins have been believed to be valuable medicines, and to possess virtues that neither resins nor gums did, practitioners have been very solicitous to find out a menstruum that would dissolve the whole; and, as they observed that they could neither be dissolved by water, nor by alcohol, with one of which they formerly attempted the solution, they thought that they were very untractable substances, not to be dissolved:

without the addition of some saline or sapo-
naceous body; and therefore they often
ordered them to be first triturated and di-
gested with the lixivium of tartar, to
open them, as they imagined, and to
make them afterwards soluble in different
menstrua; but the alkaline salts not only
decompose and alter the nature of the medi-
cine, but likewise often prevent the men-
struum from dissolving so much of the gum-
resin, as otherwise it would do; and there-
fore this method has been laid aside.

In the year 1747, Mr. Barton, an
apothecary at Dublin, published a treatise
on the manufacture of drugs, without put-
ting his name to it, in which he demon-
strated, from certain experiments, that myrrh
and other pure gum-resins cannot be dis-
solved into a tincture or clear solution, either
by pure spirit, or by water; but that they
may be reduced into a lactescent liquor,
either by digesting them in a diluted spirit,
or by triturating them with water in a mor-
tar; and that these two were the proper and
most elegant methods of preparing a formula,
that would contain the whole virtues of the

gum-resins; and he adds, that we may always suspect these solutions which are clear and limpid, to be either a solution of only the gummous, or of the resinous parts; but not of both; though, since Mr. Barton published his treatise, Dr. Macbride, in his *Experimental Essays*, has told us, that a true and perfect clear solution may be made of these gum-resins, by boiling them with an equal quantity of quicklime in water.

At present, the common menstrua employed for dissolving gum-resins, and their different parts, are water and spirit, either pure or mixed, in different proportions; when pure, they dissolve only one part, either the gummous, or the resinous, unless the gum-resins contain other principles besides the pure gum and resin, which are of a saline or saponaceous nature, and render some of the gummous parts soluble in spirit, or some of the resinous in water; so that we cannot always conclude, that water will dissolve none of the resinous parts, nor spirit any of the gummous. Hitherto chymists have not examined these substances so particularly, as to determine what are the principles that
are

are commonly mixed with the particular kinds of gum-resins, and what is the fittest menstruum for each.

Some physicians think that the gum-resins are preferable, in substance, to any of their preparations; and therefore often order them to be given in form of pills, or of powders; but, with regard to the powders, it ought to be observed, that some of these gum-resins, the *asafætida*, the *galbanum*, and *sagapenum*, cannot be reduced to powder by themselves, except during the time of intense frost; and that, when the frost is over, they concrete again into lumps in a short time; especially if the weather becomes warm: that *opopanax* is with difficulty reduced to powder; and that myrrh must be very well dried before it can be powdered.

S E C T. II.

Of particular Gum-Resins.

THE gum-resins which at present are most in use, are *Aloes*, *G. Ammoniacum*, *G.*

Asafœtida, *G. Bdellium*, *Euphorbium*, *G. Galbanum*, *G. Gambogia*, *G. Guaiacum*, *G. Kina*, *G. Lacca*, *G. Myrrha*, *G. Olibanum*, *Opium*, *G. Opoponax*, *G. Sagapenum*, *Sarcocolla*, *Scammonium*, *Terra Japonica*.

Of these the *g. ammoniac*, the *g. asafœtida*, the *g. bdellium*, the *g. galbanum*, the *g. myrrha*, the *g. olibanum*, the *g. opoponax*, and *g. sagapenum* have been called by the general name of fetid gums, and been used often for the same purposes; the particular virtues of each of them not having been hitherto sufficiently distinguished, they have all of them been believed to be good antiseptic, cordial, and strengthening medicines, and to be powerful resolvents of obstructions of the glands, and of the uterine vessels; and to be useful remedies for allaying the too great irritability of the nerves, spasms, and convulsions.

The *g. kino* and *terra Japonica* are looked upon as astringents, and the *g. guaiacum* as diaphoretic.

The *opium* is the most powerful soporific anodyne known; and the *aloe*, *gambogia*, *sarcocolla*, and *scammonium* are purgative.

1. *G. Asa-*

1. *G. Asafætida.*

G. Asafætida. Asafoetida is a strong-smelling, fetid gum-resin, of a bitter, acrid taste, which is brought home in lumps, composed of drops of different colours, whitish, pale brown, violet, and reddish. It is got from a plant growing in the mountains of Ghilan, in Persia, called by Linnaeus *ferula asafætida*, which has lately been reared in the botanical gardens at St. Peterburgh in Russia, and at Edinburgh in Scotland; and a description and figure of the plant, sent by the late Dr. John Hope, of Edinburgh, has been published in the 75th volume of the Philosophical Transactions. It is said to be only obtained by wounding the root of this plant.

It does not dissolve entirely either in an aqueous or spirituous menstruum; but more is taken up by the water, than the spirit. *Cartheuser* says, that half an ounce of it yielded only four scruples and some grains of extract to spirit, from whence he concludes, that the greater part of it is composed of gum. Dr. Lewis, in his translation of the Edinburgh Dispensary

Dispensatory of 1744, says, “ digested in
 “ proof spirit a turbid solution is obtained,
 “ which passes the filter, and upon exami-
 “ nation, is found to participate largely of
 “ the asafœtida. With rectified spirit a
 “ transparent tincture is extracted, which
 “ smells very strong, but does not appear
 “ to hold so much of this juice as the for-
 “ mer. Put on a red-hot iron it melts;
 “ emits a strong-smelling fume, catches
 “ flame, and burns almost entirely away;
 “ leaving but few ashes.”

It is recommended as a good medicine in
 hysterical and hypochondriacal disorders; in
 spasms, and twitchings of the tendons;
 in convulsions, in low fevers, in obstructions
 of the menses, and other uterine complaints;
 and in cold, flatulent, and phlegmatic
 disorders, in nervous asthmas, &c. Dr.
Bergius, in his *Materia Medica*, says, that
 he has cured old intermitting complaints
 with the asafœtida pills; but that they had
 no effect on recent cases of the same kind;
 and that it was sometimes of use to join it
 with the bark. It is often of service to
 give it by way of clyster, in cases of the
 tympanites,

tympanites, and in hysterical and other spasmodic affections. *Geoffroy* says, that it is esteemed to be an efficacious remedy for relieving the effects produced by opium, and other narcotics. It certainly is an useful medicine in the diseases for which it has been recommended, when administered with caution, and at proper times; but, like other active medicines, is apt to do hurt, if given injudiciously.

I have often ordered it to be joined with opium in anodyne draughts, which were to be taken at night to procure sleep; it seemed to diminish a little, though not much, the soporific effect of the opium; and many patients said, that it prevented or lessened that heaviness and sort of dull headache, which they used to have after taking the opiate draught without it.

It is given in substance from five or six grains to half a dram or more, for a dose; and in clysters, from half a dram to two drams.

The *tinctura fœtida*, made by digesting four ounces of the *asafoetida* in two pints of rectified spirit, contains only the resinous
parts

parts of this gum; it is used for the same purposes as the asafœtida itself, and is given from ten to sixty drops for a dose.

The *tinctura fuliginis*, made by digesting two ounces of soot of wood, and an ounce of asafœtida, in two pints of proof spirit, contains some of the gummous as well as of the resinous parts of the asafœtida, besides the saline and fetid oily matter it gets from the soot. This tincture has been used for the same purposes as the *tinctura fœtida*; from the addition of the soot it has been believed to be more particularly useful in the convulsive fits children are subject to; but whether it is so or not, I cannot determine from any observations I have made.

The *spiritus volatilis fœtidus*, in which the volatile fetid parts of the asafœtida are united, by distillation, to the volatile spirit of sal ammoniac, is an elegant and good stimulating remedy in low, nervous, and hysteric cases.

2. G. *Ammoniacum*.

G. *Ammoniacum*. Gum ammoniac, or hammoniac, is a gum-resin brought home in lumps;

lumps; composed of drops, commonly of different colours, white, yellow, brown, mixed with bits of sticks, straws, seeds, and other impurities; it has a viscid, nauseous, bitter taste, and a strong, but not disagreeable smell. It is the inspissated lactescent juice of a ferulous or umbelliferous plant, not as yet described, which grows in Africa, west of Egypt, in the country of Barca, formerly called Lybia Cyreniaca, near to where stood the famous temple of Jupiter Ammon, from whence this gum has got its name. It is brought to the western part of Europe from Egypt, and to England from the Red Sea, by some of the ships belonging to the East-India Company, which trade to those parts.

Cartheuser says, that it contains more gummous than resinous parts.

It is a good deal of the same nature as the asafœtida, and is prescribed for the same purposes; but, for what reason I know not, it is generally looked upon more particularly as a pectoral medicine than any other of the gums; and is often ordered as such in coughs

coughs and asthma's, from viscid phlegm obstructing the bronchiæ.

It is given in substance from five grains to half a dram, for a dose.

It is often joined to squills in form of pills; when from four to ten or more grains of the gum, and one of the dried squills, are given for a dose. And the oxymel of squills is often mixed with the lac, or watery solution of the gum ammoniac. In the lac ammoniacum of the Dispensatory, two drams of this gum are dissolved in eight ounces of the simple water drawn from penny-royal.

3. *G. Bdellium.*

G. Bdellium. Bdellium is a gum-resin of a reddish brown colour, like common glue, somewhat tough and semi-pellucid; it has a warm bitterish taste, and a fragrant smell. It is brought from Arabia, Medea, and the East Indies. It is not known from what tree it is got. It has been recommended as diuretic and sudorific, and alledged to agree with the myrrh in its virtues.

At

At present it is very little used in this country.

4. *G. Euphorbium.*

Euphorbium is a gum-resin, in small friable drops, of a yellowish colour, and a most acrid caustic taste, and has no smell. It is brought from Africa, and from the East Indies, and is the concreted juice of a plant of the same name, which Dr. Alston supposes to be the *Euphorbium verum antiquorum* Schadidi, calli horti Malabarici; and it is called *Euphorbia officinalis*, by *Linnaeus*; though the particular species of the plant from which it is got does not seem to be fully ascertained.

It is so violent and acrid an emetic and cathartic medicine, that it has been thrown out of most pharmacopœias, being esteemed too virulent for internal use.

5. *G. Galbanum.*

G. Galbanum. Galbanum is a gum-resin of a yellowish colour, intermixed with whitish or greenish drops, which becomes brownish by keeping; it has a warm bitterish

ish taste, and a strong, but not unpleasant smell. It is brought from Smyrna and Aleppo, in Turkey, and from the Red Sea, by the ships belonging to the East-India Company. The plant from which it is got grows in Ethiopia, and has been called by authors *ferula Africana galbanifera*. Dr. Alston says, that he does not think that the particular species of plant is as yet fully ascertained; though Linnæus calls it *bubon galbanum*, and gives a description of it as if it was well known. As it is brought home, it is generally full of stalks and other impurities.

Cartheuser tells us, that the galbanum contains a great deal more resin, than gum; for half an ounce of it yielded only to water about two scruples; while an equal quantity of it yielded to spirit near three drams of extract. He says, that it abounds with a fine essential oil, and that a pound of it affords about six drams of this oil by a humid distillation, which is the more fragrant, the fresher the galbanum is. If galbanum be distilled in a retort by itself, with a gentle heat, that there first comes over a thin oil,
which

which is of a blueish or violet colour, and still shews marks of an æthereal oil; it becomes of a purple colour by being exposed to the air.

Geoffroy says, that it is soluble both in wine and in vinegar; and *Dr. Lewis* tells us, that two parts of spirits of wine and one of water, is the best and most proper menstruum for dissolving it.

It has been used as an internal medicine for the same purposes as the *asafoetida* and *ammoniac*, and it is an ingredient in the *pilulæ gummosæ*; it having been recommended in coughs, asthmas, obstructions of the menses, hysteric and nervous disorders.

Both this and the gum *ammoniac*, when dissolved in vinegar, have been much used as external applications, for discussing hard indolent swellings and tumors; and when united with ointments and plasters, have been esteemed good remedies for promoting suppuration.

6. *G. Lacca.*

Gummi Lacca. Gum lac is a hard, semi-pellucid, resinous substance, of a reddish

brown colour, which has little taste or smell, though fragrant and sweet-scented while burning.

It was ranked among the vegetable gum-resinous substances, till *Amatus Lusitanus* alledged that it was an animal production, and since him many authors have confirmed his opinion; it is now known to be a substance deposited on the branches of trees, by little red ants with wings, who collect it from the leaves, flowers, &c. of plants, in the same manner as bees collect the matter for forming wax and honey. It should seem to be the matter which forms their hive or nests; for if a piece of what adheres to the sticks on which it is deposited, be broke, it appears to be composed of regular cells, like the honey-combs, with small corpuscles, of a deep red colour, lodged in them, which are supposed either to be the involucra or embryoes of the insects; and to these is owing the colour which lac yields to liquors. The lac is now seldom used as a medicine: it is omitted in the pharmacopœia, and is principally employed as a colouring drug, and for making sealing wax.

7. *G. Myrrha.*

G. Myrrha. Myrrh is a gum-resin of a brown, or reddish yellow colour, somewhat pellucid; it has an oily, aromatic, bitter taste, and a fragrant smell. The tree which affords it grows in Arabia and Ethiopia; but we as yet know no further about it.

That is reckoned the best sort of this gum, which is of a brownish, or reddish yellow colour, and somewhat transparent; and which, when powdered, is of a bright yellow colour.

Dr. Fred. Hoffman tells us, that when a pound of it is reduced to powder and distilled with water, that a white fragrant water, which smells strong of the myrrh, and is mixed with a fine essential oil, comes over first; and that, by allowing this water to stand for some days, from two to three drams of this essential oil may be separated from it.

Cartheuser says, that the myrrh is mostly composed of a gummous matter, and contains but a small portion of resin; for, by

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digesting an ounce of it in water, he obtained from the water, after being filtered, seven drams and three grains of an extract, which resembled the myrrh in taste and in smell; and on drying the residuum, and digesting it in spirit, he obtained two scruples and five grains of resinous extract, and there remained only eleven or twelve grains of insoluble matter; but it is probable that the resinous parts are rather in larger quantity than here alledged; for he thinks that some of its oil and resin was suspended in the water; for the watery solution was turbid, and in the same manner that spirit suspends some of the gummous; for on infusing a like quantity (an ounce) in rectified spirit, he got, by evaporating the spirit, half an ounce of solid extract, which he suspects to contain part of the gummous matter of the myrrh. It is not improbable that myrrh contains some sort of saline matter, which renders part of the resin soluble in water, and part of the gum soluble in spirit.

Dr. *Pemberton*, in the narrative prefixed to his translation of the last edition of the
London

London Pharmacopœia, mentions, that the Committee found that myrrh boiled in water dissolves freely, and while the water is boiling hot, keeps it almost entirely suspended; but when the water is cold, about one third or less subsides, much the greater part remaining united with the cold water. This water evaporated, leaves a gum soluble again in water, but which will not give so much as a tincture to spirit; spirit will take up a great part of what precipitates from the decoction, the rest seeming to be dregs. The Committee likewise found, that the addition of salt of tartar did not increase the solvent power of spirits with respect to myrrh.

Myrrh is a warm cordial, and a strong antiseptic remedy, which has often been used in putrid diseases; and of late many physicians have joined it to the bark, in obstinate intermitting fevers, and in the putrid ulcerated sore throat, and in cases where an acrid scorbutic or other morbid diathesis of the blood was suspected to prevail. It has sometimes been given by itself, or joined to nutmeg, or to chamomile

flowers and alum, as a cure for the ague; and Mr. Wilson, of Henrietta-street, Covent-garden, has assured me, that he has given, by order of the late Dr. John Armstrong, a dram of myrrh in powder, every three or four hours, to prevent the fit of an intermittent.

Myrrh has long been esteemed to be a good medicine for resolving viscid, pituitous, and phlegmatic humours, and for strengthening the habit, particularly of the fair sex. It promotes the watery secretions, and has long been esteemed a useful remedy for removing uterine obstructions, and for promoting the menstrual discharge.

In the year 1776, the late Dr. Moses Griffith published a treatise on *hectic and slow fevers, &c.* in which he recommends the use of myrrh, joined with sal martis, and sal absynthii, in a variety of complaints, particularly hectic and hysteric; he ordered from ten grains to a dram of myrrh, to be mixed with from seven to twenty-four grains of the alkaline salt, and from three to twelve grains of the sal martis, and to be made
up

up into draughts, with some of the simple waters; since which time, medicines of this kind have been much used by some physicians in London. From considering this prescription, it is evident that it is myrrh joined to tartarus vitriolatus, and some crocus martis; for the alkaline salt unites with the vitriolic acid of the sal martis, and precipitates the iron. It would be a more elegant method of prescribing this medicine, to order so much tartarus vitriolatus, and so much crocus or limatura ferri, in place of the sal martis and sal absynthii.

Myrrh has been recommended in a variety of complaints; but it ought always to be remembered, that it is a warm cordial medicine, and therefore ought to be given with caution, where there is much heat and fever; and its effects ought to be attended to. If it is found to heat or to increase the fever, its use ought to be laid aside, particularly in cases of internal suppurations, where there is no free outlet to the matter; if there is a free discharge of matter, and myrrh does not heat nor aggravate the

symptoms, its use may be continued the longer.

Myrrh is given in substance, from five grains to a dram for a dose; or it may be made into an emulsion, prepared in the same manner as the lac ammoniacum.

There is in the London Pharmacopœia, a *tincture* ordered to be made, by digesting three ounces of myrrh in a pint and a half of proof, and half a pint of rectified spirit. It is given for the same purposes as the myrrh in substance, in doses from a scruple to two drams. And there is another tincture under the name of *elixir myrrhæ*, which is prepared by digesting an ounce of the extract of sabin in a pint of tincture of castor, and half a pint of tincture of myrrh, which has been esteemed a powerful remedy for removing uterine obstructions, and promoting the menstrual discharge. It has been given from a scruple to a dram for a dose, in a proper vehicle.

It is joined to aloes in the elixir aloes, and in the pilulæ ex aloë cum myrrha.

Myrrh and its tincture have been used as
appli-

applications for drying and healing sores and ulcers; its tincture is often put into gargles, for washing ulcerated sore throats; and into washes, for cleansing and preserving the teeth.

8. *G. Olibanum.*

G. Olibanum, seu *Thus masculum officin.* Olibanum, or Frankincense, is a hard, yellowish white, or light brownish coloured gum-resin, scarcely pellucid, which is brought home in drops of different figures and sizes, and has a warm, bitter, resinous taste, and a fragrant smell. It is brought from Turkey, and from the East Indies; and, Tournefort says, likewise from Spain. It is the produce of a tree which grows in Ethiopia and Arabia, which is called by Linnæus *juniperus lycia*. Cartheuser says, that it is made up of nearly an equal quantity of gummous and of resinous parts; but that the resin is rather in greatest quantity.

It is used as a strengthening balsamic medicine, in the diabetes, in incontinencies of urine, in the fluor albus, in gleet, and in other immoderate discharges of thin or

acid humour, and in various other disorders.

It is given in substance from five grains to half a dram for a dose; and it is often made up into pills with extract of bark. Like other gum-resins, it may be dissolved in water in form of an emulsion.

9. *G. Opoponax.*

G. Opoponax. Opoponax is a gum-resin of a brownish, or reddish yellow colour on the outside, somewhat paler within, and sometimes variegated; of a warm, bitterish taste, and fragrant smell. It is brought from Turkey and the East Indies, in irregular lumps, seldom in round drops or tears. *Galen* tells us, that it is obtained from the roots of the *panax Heracleum*, or *Herculeum*, called by *Linnaeus pastinaca opoponax*, in English *Hercules's all-heal*. It grows in Syria, and other warm countries; and *Dr. Alston* says likewise in Italy, Sicily, the south of France, &c.

Like other fetid gum-resins it has been called aperient, attenuating, and diaphoretic, and

and useful for promoting the menstrual discharge. It has been used outwardly as a discutient application to scrophulous, and other hard tumors. It is an ingredient in the pilulæ gummosæ.

10. *G. Sagapenum.*

G. Sagapenum. Sagapenum is a gum-resin of a brownish colour without, but greenish within; it has a hot, biting, bitterish taste, and a strong smell, somewhat resembling that of leeks, or of asafœtida mixed with galbanum. It is brought home in lumps or masses, composed of drops clotted together with extraneous substances: it is brought from Egypt and Persia, and is the product of a plant growing in Medea and in other countries, called in Bauhinus's *Pinax ferula fœmina Plinii*, and *ferula folio fœniculi*, I. B. but as yet it should seem that the plant has not been described with sufficient accuracy.

By Cartheuser's account, it contains more gummous than resinous parts; half an ounce of it yielding two drams and two scruples
of

of extract, to water, and only a dram and a half to spirit.

This gum-resin, which is milder than the asafœtida, but warmer than the galbanum, is often used as a deobstruent and aperient medicine, both by itself, and joined to other gums: it has been employed for most of the same purposes as the asafœtida and galbanum. It is given in doses, from five grains to half a dram or more. It is an ingredient in the pilulæ gummosæ.

II. *G. Guaiacum.*

G. Guaiacum. *G. Guaiac* is a gum-resin, in which *Cartheuser* says the resinous are in much greater quantity than the gummous parts: it exsudes from incisions made into the trunk of a tree growing in the Spanish West Indies, and in Jamaica, called *lignum guaiacum*, and *lignum vitæ*; by Linnæus *guaiacum offic.* in English guaiac wood, and *lignum vitæ*.

This gum-resin is brought home in irregular masses, which are brittle, of a dusky green, and sometimes of a reddish colour, with pieces of wood amongst them.

That

That which is made at home, under the name of *extract* of *guaiac wood*, contains a greater proportion of gum than the natural gum-resin, being ordered by the college to be prepared by boiling the shavings of the guaiac wood in water.

Both of them are nearly of the same nature, and used for the same purposes. They have a bitter, acrid, pungent, aromatic taste, and but little smell; they are diaphoretic, sudorific, and diuretic, and if taken in a quantity above ten grains for a dose, they generally prove purgative. They are principally employed as diaphoretics or sudorifics in rheumatic, venereal, or paralytic cases, and are given in doses, from five to forty grains.

When used in substance, their viscosity ought to be destroyed by beating them up with the yolk of an egg, or by triturating them with sugar, or with honey, or blanched almonds, or some other saponaceous substance, which makes them operate much more freely than when this precaution is not taken.

In the pharmacopœia, a tincture is ordered

dered to be drawn from four ounces of the gum guaiac, by a pint and a half of the spiritus volatilis aromaticus, which is much used as a stimulating diaphoretic medicine, and given in doses from half a dram to two drams.

12. *G. Kino.*

G. Kino is a red astringent gum-resin, brought from the country through which the river Gambia runs, in Africa. Dr. Fothergill, who gave the account of this gum in the London Medical Observations and Inquiries, says, that about five or six parts in seven dissolve in water, and communicate a deep red colour, and a strong astringent taste to it, and that most of what remains is resinous. The author of the new edition of Dr. Lewis's New Dispensatory alledges, that its colouring and astringent parts are more powerfully taken up by spirit, than by water. Dr. Fothergill tells us, that Dr. Oldfield first mentioned this gum to him, and told him that he had seen it produce good effects in several cases of old habitual diarrhoeas, in which cases, he says,

he has found it of use ; and he recommends it in habitual diarrhoeas, in the fluor albus, in immoderate menstrual discharges, and in general in all such cases as proceed from laxity and acrimony.

13. *Terra Japonica.*

Terra Japonica Catechu offic. Japan earth, improperly so called, for it is neither an earth, nor does it come from Japan ; but is really an inspissated juice of the gum-resinous kind, brought from the East Indies, and is the product of a tree of the palm kind, growing there, which is called by Linnæus *mimosa catechu*, seu *areca catechu*.

The terra Japonica is of a dark red colour, has an astringent, bitterish taste, with something of a sweetness. *Cartheuser* says, that it is mostly of a gummous nature, for that the greater part of it is soluble in water ; what remains dissolves in spirit. Dr. *Lewis*, in his New Dispensatory, affirms, that, when it is pure, it dissolves totally in water, and almost totally in rectified spirit ; and he adds, that, as we usually meet with it,

it, a considerable quantity of fundry matter is left by both these menstrua.

It has been prescribed as a gentle astringent, in diarrhoeas and dysenteries, in the fluor albus, and in overflowings of the menses, and in floodings, when mixed with alum; and to restrain too great discharges of thin humours from the lungs and other parts, which proceed from laxity.

There is in the Pharmacopœia, a *tinctura catechu*, (*Japonica*,) prepared by macerating three ounces of this gum-resin, and two ounces of cinnamon, in a quart of proof spirit, for three days, which possesses most of the virtues of the terra Japonica, joined to those it acquires from the cinnamon and spirit.

In the last edition of the London Pharmacopœia, there were troches or tablets ordered to be made with equal parts of terra Japonica and g. arabic, and four parts of sugar, and water, which was an elegant form for giving it in substance.

14. *Opium*.

Opium. ΟΠΟΣ ΤΩΝ ΚΩΔΕΙΩΝ. *Opium*, or the
sap

sap (or lactescent juice) of the white poppy-heads. It was called simply *opios* or *opos*, the sap, by the Greeks, in the same manner as in England we say *the bark*, meaning the Peruvian bark, on account of its great efficacy and virtue.

Dr. Alston, who has wrote a most accurate account of this gum-resinous substance, in the fifth volume of the Edinburgh Medical Essays; has put it beyond all doubt; that opium is the proper or milky juice which issues from incisions made into the heads of the white poppy heads, while they are yet growing, inspissated in the open air; and he has told us the manner of preparing it.

The description he has given of this gum-resin, is; that opium is the proper or milky juice which issues from incisions made in the poppy-heads, thickened in the open air, into a solid, but softish resinous gum, of a dark reddish brown colour, and of a very hot, bitter taste, and strong, heavy, or soporiferous smell; brought from the Levant, and East Indies, in round flat cakes, or more irregular loaves of different sizes, from four ounces to a pound or upwards in weight,

and covered with leaves or other vegetable stuff, to prevent their running and sticking together.

He observes, that it is the same as the opium of the ancients, which was prepared from the milky juice of the poppy-heads, nearly in the same manner as at this day; but that their *meconium* was made of the expressed juice, or of the decoction of the same plant, which differs widely in taste, smell, and quality, from the true opium. Pliny, in his Natural History, book xxth, chap. 18th, after mentioning how opium is got by making incisions into the poppy-head, adds “ cum capita ipsa et folia deco-
“ quantur, succus meconium vocatur, mul-
“ tum opio ignavior.”

The Doctor made a number of experiments with opium, and he found that neither alcohol nor water dissolved it intirely; but a proof spirit dissolved all, except the sæculent part of it, and therefore he concludes that this is the most proper menstruum for making a tincture of it.

By his experiments it appears, that twelve parts of water, or of wine, or of vinegar, mixed with one part of opium, sliced thin, and
let

let stand for a month, dissolve $\frac{8}{12}$ or two third parts of it; that 12 parts of alcohol dissolve $\frac{4}{12}$ or one third part, and that if the remainder be infused in 12 times its weight of water, that the water dissolves $\frac{5}{12}$ parts more; and that the remaining $\frac{3}{12}$ ths, or one fourth part, were composed of a matter insoluble in either spirit or in water; and that when opium was digested without heat, in twelve times its own weight of proof spirit for a month, nine-twelfths ($\frac{9}{12}$) of the opium were dissolved, the same quantity as alcohol, and then water, had dissolved before; and the remaining $\frac{3}{12}$ ths were not soluble in either spirit or water, as in the former experiment. Hence it appears, that twelve ounces of proof spirit dissolve six drams out of eight of solid opium, infused in it for a month; and that a dram of such a tincture contains three grains and $\frac{3}{4}$ ths of a grain of the soluble parts of opium.

These experiments made by Dr. Alston agree, as nearly as possible, with those made in May 1786 at Apothecaries Hall, where it was found that proof spirit dissolved exactly nine-twelfth ($\frac{9}{12}$) parts of solid opium; and that a tincture made with proof spirit, and fully saturated with opium, by infusing

two ounces of it in sixteen of the spirit for a month, contained very near indeed the same quantity as the tincture made by Dr. Allston; for on its being filtered through paper, and three parcels, of twenty drams each, being evaporated to dryness in three different glasses, with a gentle heat, 1. The first quantity yielded a dram and $14\frac{1}{2}$ grains. 2. The second a dram and 13 grains. 3. The third a dram and 14 grains. By which it appears that each dram of this tincture, which is now adopted into the London Pharmacopœia, contains about three grains and $\frac{1}{16}$ th parts of a grain of opium.

As a dram of this tincture, which contains three grains and two-thirds of a grain of opium, is too small a quantity of liquor to be easily divided by weight or by measures, physicians when they prescribe this tincture to their patients, generally order that so many drops should be taken for a dose; but this is a most uncertain method of ascertaining the dose of this very powerful and efficacious medicine, and patients get at one time double the dose the physician intended, and at another not one half of it; for whoever will give himself the trouble to
try.

try the experiment, and will put two parcels of the same liquor into two vials, the one with a rounded brim, the other with a flat, and will drop very slowly two hundred drops from the rounded-brim vial, into one cup, and the same number of drops quickly from the flat-brimmed vial into another cup, and will then weigh the two cups separately, he will find that the two hundred drops which had been dropt slowly, weigh a half at least, if not double, more than the two hundred which had been dropt quickly.

If therefore a tincture was to be made which could be dispensed in doses determined by weight or measure, it would be of great advantage both to the physician and to the sick, as the exact dose of opium the patient takes would at all times be known.

From the experiments above mentioned, it appears that a dram of proof spirit, fully saturated with opium (the tinctura opii) contains $3\frac{2}{3}$ grains of opium, and of consequence that three drams contain eleven grains; if therefore we add eight drams of proof spirit, or as much of any of the spirituous waters, we have a tincture, a dram of which contains exactly one grain of

D d 3 opium;

opium; and this tincture may be again diluted to any degree; for if we wish that a dram should only contain a quarter of a grain, we have only to add a dram of this tincture to three drams of proof spirit. As it might be dangerous to keep in the shops two tinctures of opium, a *weak* and a *strong*, under the same name, with only the addition of *dilutior*, or of *fortior*, the weak one ought to have a distinct name for itself; and in order to make it still more different from the strong, eight parts of some of the spirituous simple waters ought to be added to three of the strong tincture of opium, to give it a different flavour; by which means, all danger of mistake will be avoided. The following tincture is calculated to answer these purposes:

Tinctura Codiata or Kodeiata.

R. Tincturæ opii uncias tres,

Aquæ feminum carvi uncias octo: misce.

As it is at present the custom to give medicines such names as let it be known of what they are made, I have called this tincture by the name of *codiata* or *kodeiata*, to shew that it is a preparation from the poppy-head.

head. The word *codiata*, borrowed from the Greek, may seem improper; but the true Latin name would have been too long, *tinctura succi lactescentis capitum papaverum inspissati*.

It may be said that it is needless to order a medicine of this kind to be kept in the shops, as the tincture, and spirit of which it is composed, can be mixed occasionally, when wanted; but whoever considers how frequently opium, in a liquid form, is ordered to be taken in small doses; and how troublesome it is to weigh or measure exactly small quantities of two liquors, which are to be mixed in different proportions, will immediately think that it is right to keep a medicine of this kind always prepared in the shops; particularly as it is one of those which keeps long without being decomposed; and the proportions of the ingredients of which it is made can be better and more exactly ascertained, by mixing them by ounces, than by quarters, or half scruples.

In the new edition of the London Pharmacopœia there is a *pulvis opiatu*s, which

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contains

contains nine parts of prepared hartshorn, and one part of purified opium, so that ten grains of it contains one of opium. There is likewise a *pilula ex opio*, made with four parts of extract of liquorice and one part of purified opium, and a sufficient quantity of the simple syrup, so that between five and six grains of this pill contains one of pure opium. And the *Philonium Londinense*, thirty-six grains of which contains one grain of opium, is still retained under the name of *confectio opiata*.

Opium eases pain, procures sleep, increaseth the humours, promotes perspiration, allays the too great irritability of the nerves, and is one of the most powerful antispasmodics we know.

If given in large doses, it deadens all the sensations, and brings on sleep, and a general relaxation of the fibres.

If given in too great quantity, it brings on a lethargy, and an universal relaxation, and insensibility of the nervous system, which terminates in convulsions and in death.

It is used in most cases where there are
spasms.

spasms, and too great an irritability of the nervous system, such as in hysterical and hypochondriacal disorders; in convulsions, from violent pain, after fractures, and such like accidents; in the end of fevers, where there is an obstinate wakefulness; in the small pox, and in many other disorders, where there is not too great a degree of heat or of fever to contraindicate its use,

It is an excellent remedy in coughs, from thin tickling rheums, where there are not obstructions, or obstinate infarctions of the lungs; for it allays the too great irritability of the nerves, and it inviscates and in-crassates the humours.

It acts as an astringent in the bowels, and it is used to moderate or to stop the too great discharge by stool, in the diarrhoea and dysentery. Some few people, however, it purges, two or three instances of which I have met with.

In large doses, it is one of the most powerful diaphoretic medicines known, especially when joined to ipecacuanha, antimonials, castor, camphor, volatile salts, &c. The mixture of asafoetida with it, is believed to lessen

lessen its narcotic qualities greatly, and to prevent its leaving a heaviness and stupidity after its operation.

It not only eases pain, and allays spasm, when taken inwardly; but produces similar effects when applied externally. From the experiments made by the late Dr. Whytt, and by my brother, the professor of anatomy at Edinburgh, which are mentioned in the 2d and 3d volume of the Edinburgh Literary and Physical Essays, it is evident that opium and its solutions applied externally, are not only absorbed, but act likewise on the nerves, with which they come in immediate contact, especially when applied to wounds or sores in which nerves are exposed. I have often seen fomentations and cataplasms made with a decoction of the white poppy-head, and solutions of opium mixed with poultices, applied to diseased parts, act as anodynes in easing pain, and procuring rest.

Opium, with some people, instead of procuring rest, raises the spirits, occasions restlessness, and brings on an intoxication, similar to that produced by spirituous liquors,
which

which frequently happens when it is underdosed; though it is to be owned, that there are some people who cannot bear opium in any form, and in whom it always produces restlessness, sickness, or delirium.

With regard to the use of opium, it ought to be observed, that if people are in great pain, or attacked with the tetanus, or locked jaw, they will bear a much larger dose than at another time, without being affected by it. I have seen people, labouring under the locked jaw, take forty, fifty, sixty, or more drops of laudanum, every hour, without feeling any sensible effects from it, who could not have taken one of these doses once in twenty-four hours, without being thrown into a heavy deep sleep by it. In the year 1766, a country farmer, aged seventy-five years, came to St. George's Hospital, to be cut for the stone, which occasioned violent and frequent fits of pain; to relieve which, he had accustomed himself, for some years, to the free use of solid opium, and used to take, every night at bed-time, four large pills, each of which weighed ten grains, and they did not affect him

him so much as a dose of laudanum of twenty drops would have affected another person unaccustomed to it, and who felt no pain. He underwent the operation for the stone, and two calculi, weighing together six ounces, were taken out of his bladder; the day after the operation, he told me that he was easy, and free from pain, and after this, for twelve days that he lived, one of his anodyne pills affected him much more than the four had done before.

Opium has long been used to ease pain in rheumatic, venereal, and other disorders; of late it has been alledged not only to ease pain, but likewise to cure venereal complaints of a bad kind; and even to eradicate the disorder, after mercurial and other remedies have had no effect. Dr. Willis, in sect. 7. of chap. i. of the first part of his *Pharm. Rationalis*, mentions the case of a gentleman who laboured under violent nocturnal pains, from an ill-cured lues venerea, which brought on a dropsy. Becoming averse to medicine, he sent for Dr. Willis, to know if he might increase the dose of laudanum he was accustomed to take, in order
to

to ease the violence of his pain : the doctor looking upon him as a dying man, consented ; and the patient continued increasing his dose, till he took daily such a quantity as was almost incredible, which sweated him profusely every night, and made him pass a very large quantity of urine : in a month's time, all his dropfical swellings were gone, his nocturnal pains had left him, and he was able to walk abroad.

In the year 1785, Mr. A. Grant, one of the surgeons to the military hospitals, published *Observations on the Use of Opium in Diseases*, supposed to be owing to morbid Irritability : in which he mentions several old venereal cases, where the patients laboured under painful foul ulcers, which had resisted the effects of mercury, and of other remedies, which yielded to milder applications, and the taking opium to procure rest. He generally began with giving a grain and a half or two grains in the twenty-four hours, and he increased the quantity to four, six, or eight grains in the day ; proportioning the quantity to the circumstances of the patient : and he says,
that

that from the observations which he made, he is inclined to confine the good effects of opium to an advanced state of the disease, in which state mercury has either lost its efficacy, or seems to do mischief. A number of other essays have been published on the same subject, within these few years, in which some of the authors have gone so far as to assert that opium alone was capable of curing the venereal disorder, which induced many practitioners in Great Britain and in France to try what effects opium alone would produce in venereal complaints; but after giving it a fair trial in large hospitals and other places, in the cases of some hundreds of patients, they have all unanimously declared it to be inadequate to the purpose.

From what I have seen myself, and from what I have heard from many practitioners of extensive practice, I am convinced that opium by itself never cured a confirmed lues venerea; but where patients are under a course of mercury, that opium frequently enables them to continue its use longer, and with greater ease, till the disorder is eradicated, than otherwise they could have done; that

that where mercury has lost its efficacy, or seems to do mischief, the laying it aside, and putting patients on a mild, soft diet, and making them drink freely of soft liquors, while opium is given freely to allay the too great or morbid irritability of the nerves, is of the greatest service; for soon after such courses are entered upon, the sores often begin to heal, and the patient to recover daily, as I have seen happen in many instances; for in such cases the venereal virus is often gone, and the sores are prevented from healing by the thinness and acrimony of the juices, occasioned by the mercury, and not by any of the venereal virus remaining behind; at other times the opium and mild drinks, which promote the secretions of the thinner fluids, by the skin and the kidneys, seem to carry off with them both the mercury and latent virus or acrimony which remained behind, though the opium was not capable of curing the disorder, while it was yet recent and in full force; in the same manner as the decoctions, commonly called anti-venereal,

venereal, seem sometimes to do, after patients have undergone a course of mercury.

It has been much disputed, whether opium is a heating or a cooling remedy ; but I agree with Dr. *Young*, who, in his *Treatise upon Opium*, affirms that it quickens the pulse, rarefies the blood, and is improper in all those diseases where bleeding is requisite ; though in many cases, after free bleeding, opium becomes a very useful remedy for allaying spasm, and lessening the too great irritability of the nerves.

The dose of opium, to people unaccustomed to it, is from half a grain to two or three grains ; but if people habituate themselves to it, and gradually increase the quantity, they will come at last to take a quantity almost incredible : the *Turks*, who use it in place of wine, and habituate themselves to it, will sometimes take a dram or more for a dose : and *Garcian* says, that he was acquainted with a person who every day took ten drams, or more : and I knew a lady, who having habituated herself to the use of laudanum, (the *tinctura opii*) took two drams or more

of it for a dose, and repeated that frequently through the day.

In the Pharmacopœia there are several compositions into which opium enters, and which derive their virtues principally from it.

Dr. *Alston* prepared a small quantity of true opium from poppy-heads, in Scotland; and it has been suggested that it might be prepared in quantity in the southern parts of England; but how far that would answer is not easy to determine, until the experiment is made.

An *extract* or *solid meconium* may be prepared by infusing the recent dried poppy-heads and stalks in boiling water, for a night; boiling them next morning for three or four hours; straining the expressed liquor, and filtering it through paper; and afterwards evaporating it by means of a water bath, till it acquire the consistence of a thick extract. The late Mr. Thomas Arnot, a practitioner at Cowper, in the county of Fife, mentions, in the 5th volume of the Edinburgh Medical Essays, that he had prepared an extract of this

kind, which he found to be about half the strength of opium; and says that it may be used for all the same purposes as it, only that it must be given in double quantity; and that a syrup of poppies, which will be always of the same strength, may be made with it; and that he had for some years used a syrup of this kind, an ounce of which contained exactly two grains of the extract, which is in the proportion of thirty-two grains of the extract to each pound, of sixteen ounces, of the syrup.

The four natural gum-resins, which have a purgative quality, were the *aloes*, the *gambogia*, the *sarcocolla*, and the *scammonium*, which I shall next consider; and then shall just mention the *extractum jalapii*, and the *extractum catharticum*.

15. *G. Aloë.*

G. Aloë. Aloes is a gum-resin which has a nauseous bitter taste, though not a disagreeable smell; there are commonly reckoned three sorts of it, the *socotrine*, or *socotorina*. 2. The hepatic, *aloe hepatica*. 3. And the horse aloes, *aloe cabalina*, which

are all nearly of the same nature, and are the inspissated juices of certain plants of the same genus and name.

1. The *socotrine* is esteemed to be the best; it comes from the island of Socotra, situated in the Indian ocean, near to the coast of Africa, and is brought home in skins. It is the product of the plant called *aloe vera minor*, or *aloe Americana minor*; and by Linnæus, a variety of the *aloe perfoliata*. Dr. Alston says that it grows in both the East and West Indies; it is of a shining black colour, friable, and when powdered, yellow; it has a nauseous very bitter taste, and somewhat of a strong, but not disagreeable smell.

2. The *hepatic*, or Barbadoes aloes, is of a brown liver colour, and of a more offensive and fetid smell than the socotrine; it is the product of the *aloe vulgaris*, or common aloes, said by Linnæus to be a species of the *aloe perfoliata*, which Dr. Alston says grows likewise in both the East and the West Indies, and that the best sort of it comes from Barbadoes, in large gourd shells.

3. The *cabalina*, or horse aloes, is brought

from the East Indies ; it is generally fouler, and mixed more with sand and other impurities, than the other species ; it is alledged to be the product of the aloe Guineensis ; though many authors alledge that it is only the more feculent parts of the socotrine or of the hepatic aloes.

At present many botanists suspect that all these three different kinds of aloes are produced by the same species of plant, and that it is only the soil and climate in which it grows that makes any difference in the product.

All the different kinds of aloes are gum-resins, which contain more gummous than resinous parts. *Cartheuser* says that an ounce of aloes (but of what kind he does not mention) yielded five drams of gummous matter to water ; and afterwards three drams of resin to spirit ; but both Mr. Boulduc and Dr. Alston affirm that *socotrine* contains more gum, and less resin than the hepatic. Dr. Alston found that both water and spirit of wine dissolved seven out of eight parts of the socotrine ; but that water dissolved

dissolved only six parts of the hepatic, but that spirit of wine took up much more.

By Mr. Boulduc's experiments, mentioned in the Memoirs of the French Academy of Sciences, it should seem, that four ounces of socotrine aloes contain two ounces and one dram of gummous matter, six drams twenty-four grains of pure resin, about sixty grains of feculent matter, and that seven drams, forty-eight grains were lost in performing the operation, which he concludes were volatile saline parts, which had evaporated. And that four ounces of hepatic aloes yielded one ounce, three drams of gummous extract, and an equal quantity of resin, and four drams and a half of feculent matter; and that five drams and a half were lost.

Water, when of a boiling heat, dissolves all the soluble parts of aloes; but if let stand till it grows cold, it lets drop most of its resin.

A strong spirit dissolves and keeps suspended almost the whole of aloes, though it contains such a large portion of gummous

parts; hence it is evident that aloes contains some principle, saline or other, which renders water capable of dissolving resin, and spirit capable of dissolving gum. *Geoffroy*, from the analysis he made of the hepatic, concludes that it contains a considerable portion of an ammoniacal salt, and a small portion of a tartareous; and that aloes is a saline, gum-resinous substance.

By Mr. *Barton* of Dublin's experiments, mentioned in a treatise of manufacture of drugs, A. D. 1747, four drams of hepatic aloes in powder, infused in a pint of each of the following liquors, left the following quantity of residuum :

			dr.	scr.	gr.
4 drams in 16 ounces (a pint) of river water, left undissolved	_____	_____	1	1	10
_____	_____	of white wine	1	2	0
_____	_____	of proof spirit	0	1	0
_____	_____	of rect. spirit of wine	0	1	3
4 drams of focotrine aloes in lib. 1 of rect. spirit of wine			0	1	5

It is asserted by *Monf. Boulduc* and others, that the purgative quality of the aloes is principally lodged in its gummous parts; for that the gum purges briskly, while the pure resin is possessed of very little purgative quality, and that the focotrine purges
more

more freely than the hepatic. At present the socotrine is almost the only one that is ordered as an internal medicine in London.

Aloes is a stimulating stomachic purge, which, given in small quantity, operates mildly by stool; but in large doses acts roughly, and often occasions an irritation about the anus, and sometimes a discharge of blood. It is a good opening medicine, to people of a lax habit, or who live a sedentary life; and to those whose stomach and bowels are loaded with phlegm or mucus, or who are troubled with worms, or are debilitated; because at the same time that it carries off those viscid humours, which pall the appetite, and overload the intestines, it serves as a strengthener and bracer.

In small doses, repeated from time to time, it not only cleanses the primæ viæ, but likewise tends to promote the menstrual discharge in women; and therefore it is frequently employed in chlorosis, or where the menstrua are obstructed.

It is a good stomachic purge, and is given in all cases where such a one is wanted; but it is looked upon as a heating me-

dicine, and not proper in bilious habits, or where there is much heat or fever; and its continued use is apt to bring on the piles.

It is given in substance from five grains to a scruple, though formerly it used to be prescribed in doses of two or three times that quantity, but these large doses sometimes brought on troublesome symptoms. As it is a slow working purge, it is generally taken at bed-time and it operates next day.

With regard to this, as well as all other resinous purges, it ought to be observed, that when they are given in substance without any mixture, they are apt to adhere to the coats of the intestines, and to occasion griping and uneasiness; for these reasons aloes is generally mixed with some saponaceous or resolvent body, to destroy its viscid tenacity, before it is given in substance. The substances which are most used for this purpose are, a small quantity of the fixt alkaline salts; soap; the yolk of an egg; and gummous vegetable extracts. Mr. Barton alledges, that by triturating aloes with a small quantity of alkaline salts, its tenacity was more effectually destroyed, than by any
other

other thing he tried : that Castile soap and the yolk of an egg answered best, next to it ; that manna, sugar, and honey, were far inferior to them ; and that gummous, or mucous vegetable extracts, such as the extracts of gentian, or of liquorice root, triturated with the aloes, in the proportion of one part of the extract to two of the aloes, and then made up into pills with a sufficient quantity of syrup, destroyed the viscosity of the aloes, and rendered its operation mild.

In the last edition of the London Pharmacopœia, the resin and gum were ordered to be separated, and both to be kept in the shops ; but at present the aloes in substance is looked upon as a better medicine than either, and no directions are given for separating them from each other.

The aloes enter into the composition of several powders, and of two pills mentioned in the present edition of the Pharmacopœia, in most of which their purgative quality depends upon the aloes they contain ; though in others the aloes is joined to other active purgative medicines.

Tinctures

Tinctures of aloes have likewise been much used as stomachic purges.

1. One of the best tinctures made, which always keeps clear without precipitating the aloes, is that prepared by digesting an ounce of aloes in powder in a pint of proof spirit, for a fortnight, taking care to shake it daily for the first ten or twelve days, and then straining it, or filtering it through paper.

2. But as this menstruum is all spirit, and too hot for many constitutions, to be taken frequently as an eccoprotic, a tincture made of half a pint of proof spirit, and an equal quantity of sherry, or other good white wine, and an ounce of the aloes powdered, and digested in the same manner, will answer all the purposes of the former.

The dose of these two tinctures is from half an ounce to an ounce, taken at bed-time as an eccoprotic; and from an ounce to two ounces as a purge.

3. Another tincture, but milder than either of these, has been made by digesting in the same manner an ounce of powdered aloes, and half an ounce of extract of liquorice

ice sliced thin, in half a pint of proof spirit and as much water. The dose of it is from half an ounce to two ounces.

4. And there is in the Dispensatory another tincture, which has been long in use under the name of elixir of aloes, prepared by digesting for a week, without heat, three ounces of aloes, and as much saffron, in a quart of tincture of myrrh; which is used in the same manner as the other tinctures, in doses from half an ounce to two ounces. It has been reckoned to be a more powerful emmenagogue from the addition of the myrrh.

16. *G. Gambogia.*

G. Gambogia. Gummi gutta, gutta jamba. Gamboge is a yellow gum-resin, which was not known in Europe before the year 1603. It transfuses through wounds made in a tree which grows in the East Indies, in the country of Camboia, which is situated on the continent of Asia, opposite to the island of Borneo; and is brought home in large cakes or rolls. It is said by *Cartheuser* to be got ex specie *tithymali crassi* & *scandentis*;

tis; and by *Linnaeus* from a tree which he calls *gambogia gutta*. Cartheuser says, that the gummous and resinous parts are so intermixed that he could not separate them; but from the experiments he made, he thinks there is a greater quantity of gum, than of resin. *Geoffroy* alledges that five-sixth parts are resin, which dissolve in spirit, and only one sixth gum. It dissolves into a yellow emulsion, by being triturated with water; and *Dr. Lewis* says, that by the addition of an alkaline salt, it turns of a blood colour, acquires a degree of transparency, and passes the filter; that the dulcified spirit of sal ammoniac entirely dissolves it, and that this solution both mixes with water and with spirit, without growing turbid. It has no smell, and but very little taste.

Gamboge is a strong purgative medicine, which frequently vomits as well as purges; when given in large doses, it has sometimes produced such violent effects, that *Hoffman*, and many other physicians, have condemned it as a dangerous medicine, and too rough to be used; other practitioners, however, have esteemed it to be a very safe and useful remedy,

remedy, in cases where we wish to give a medicine which operates powerfully both upwards and downwards, provided it be sufficiently diluted, and be not over-dosed. *Geoffroy* says, that from two to four grains of it operate as a purge, without vomiting, though they sometimes occasion sickness; that from four to eight or ten grains of it operate mildly both as a purge, and as an emetic, and stand in no need of a corrector, provided they be sufficiently diluted: by the formulæ which he mentions, it appears that he dissolved his dose of gamboge in from six to twelve ounces of barley, or of common water, to which he added some syrup or sugar, and some distilled water or lemon-juice, to make it agreeable; and sometimes he added some manna.

He says, that in the form of pills, or of a bolus, it is more apt to vomit, but that it has seldom this effect when joined to mercury. When he ordered it in powder, he often added to it some drops of an essential oil, rubbed down with sugar.

At present it is seldom used but in dropsies, in asthma's, and in other cases where a
free

free evacuation is wanted ; and sometimes with an intention of evacuating worms. I have given it frequently, and seen other physicians use it, in doses from four to ten grains, rubbed down with crystals of tartar, or dissolved with one or two drams of manna, and it operated as a brisk purge, without occasioning any inconvenience. Physicians now are afraid of ordering large doses of this medicine, on account of the violent symptoms which have sometimes followed their exhibition.

17. *G. Sarcocolla.*

Sarcocolla. Sarcocol is a light, friable, spongy gum-resin, in small grains of a yellowish colour, and a bitter, nauseous, sweetish taste, and no smell. It is said to come from Persia, but we have no knowledge of the tree which produces it. It is a slow, griping, disagreeable cathartic, and is now never used as an internal medicine in this country. It was formerly recommended as a good external application for healing wounds and sores, but it is now entirely neglected.

18. *G. Scam-*

18. *G. Scammonium.*

G. Scammonium. Scammony is a light, friable, greyish black gum-resin, brought from the Levant, in large, somewhat shining lumps, of a whitish ash-colour when powdered, and white when wetted; it has a penetrating, subacid taste, and a disagreeable smell while recent. It is the inspissated or concrete juice of the root of the *scammonia Syriaca*, which is a species of the convolvulus; is called by Linnæus *convolvulus scammonia*. It grows in Syria, and other parts of Asiatic Turkey. *Bergius* says, that forty-eight ounces of good scammony yielded to rectified spirit twenty-two ounces of pure resin, and that the remainder yielded five ounces of gum to water. *Cartheuser* tells us, that an ounce of scammony yielded five drams of resin to spirit; and three drams to water; that the gum is mildly purgative, and that the resin acts more violently, and occasions severe griping; and that the gummous part, mixed with a little of the resin, is a safe and a mild purge. The scammony itself is a strong, stimulating, purgative medicine;
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its dose is from five grains to a scruple, which ought either to be made up into pills with soap, or with some vegetable extract; or to be rubbed with honey, or with sugar, or triturated with blanched almonds, or some other substance which will destroy its viscid tenacity. It is often mixed with other purgative medicines, as in the *pulvis e scammonio*, where two ounces of it, and as much extract of jalap, are mixed into a powder with an ounce of ginger; or in the *pulv. e scammonio cum aloe*, where an ounce and a half of aloes is mixed with six drams of extract of jalap, and as much scammony, and half an ounce of powdered ginger; or in the *pulvis basilicus*, where equal parts of scammony, crystals of tartar, calx of antimony, and mercurius sublimatus dulcis, are mixed and reduced to a fine powder: and it is a principal ingredient in the *electuarium e scammonio*, in which an ounce and a half of scammony, six drams of cloves, and as much ginger, and half a dram of the essential oil of carvi, are formed into an electuary with clarified honey.

Miller in his Botany alledges, that the
common

common convolvulus yields a gum-resin of the same nature as the scammony; but I have not heard of any trials having ever been made with it.

Extractum Catharticum.

The *extractum catharticum*, now called *extractum e colocynthide compositum*, and formerly *extractum rudii*, was made by infusing four days six drams of colocynth cut small, and half an ounce of cardamom seeds bruised, in a pint of proof spirit; and then, after straining off the spirit, and dissolving in it an ounce and a half of socotrine aloes, and half an ounce of scammony, by evaporating the spirit till the whole came to the consistence of an extract fit for forming pills.

This is a brisk purging medicine of the gum-resinous kind, which is given in doses from ten grains to half a dram. Joined to calomel (*mercurius dulcis sublimatus*), it becomes a very active medicine, where there is an obstinate costiveness; and in some cases, after every other medicine had failed, I have seen pills made of equal parts of this

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extract, and of calomel, given the length of twenty grains, and in one or two cases, to near double that quantity, for a dose, and repeated afterwards in small quantities, every hour, for some successive hours, while the patient went into the tepid bath, or his belly was frequently fomented, procure stools, and carry off the disorder.

2. *Extractum Jalapii.*

The extract of jalap, as it is ordered to be prepared, is a true gum-resin. It is a good purgative medicine, and has been given in doses from five or six grains to a scruple; if it be triturated with sugar, or with some blanchéd almonds, or beat up with a little of the yolk of an egg, it operates more mildly.

C H A P. XIII.

Of GUMS, and GUMMY EXTRACTS.

HAVING considered resins, and gum-resins, I come next to take a view of those substances called gums, which, though they have the same outward appearance with

2. resins,

resins, yet differ from them very much, and are only soluble in water.

Gums are the mucilaginous watery parts of vegetables, dried by the heat of the sun; as is proved, by evaporating, with a gentle heat, to dryness the infusions or slight decoctions of mucilaginous plants.

Macquer says, that if gums be distilled, they yield a limpid phlegm, without smell or taste; and an acid liquor of a red colour; a small quantity of an alkali, and a little thin oil, which becomes thicker as the distillation is continued; and there is left in the retort a caput mortuum, which when burnt yields a fixed alkaline salt.

Hence we see what a great difference there is between resins and gums, though they resemble each other so much in their outward appearance; for resins, we know, are the essential oils of plants thickened; and gums are their mucilaginous parts inspissated, and are composed of water, an acid, a small quantity of oil, and an earth; and they approach nearer in their principles to the saccharine, than the resinous substances.

They dissolve entirely in water, and the

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solution remains clear and limpid ; but they are not affected by spirit.

They do not unite with resins, though they may be often mixed with them in plants, which abound with both an essential oil, and a mucilage, in form of gum-resins; but although these *gum-resins* appear to be one homogeneous mass, yet the two substances, the *gum* and the *resin*, are only kept together by their viscid parts coagulating, and each of them retains its own properties; the resin, of being soluble in alcohol, without the gummous part being affected; and the gum of being soluble in water, without its touching the resin; but if, instead of simply infusing gum-resins in water, you triturate them in a mortar with it, the viscid gummous parts keep suspended the particles of the resin which have been divided, and dispersed by the rubbing, and form an emulsion; for all emulsions are only the oils of certain substances, dispersed through a watery liquor, and kept suspended, but not dissolved, or intimately united with it. In the growth of plants there seems to be going forward a process analogous to that of triturating gum and resins, or oils and gum together, to form

an

an emulsion; for in many of them the oily and gummous parts are intimately blended with the watery, so as to form a lactescent juice, which is only a more perfect emulsion than that produced by art; and it is these milky juices inspissated which produce the gum-resins.

Under this head of gums and gummous extracts, I shall consider, 1. *The Gummi Arabicum.* 2. *Gummi Cerasorum.* 3. *Gummi Seneca.* 4. *Gummi Tragacanthum.* 5. *Ichthiocollo.* 6. *Succus Acaciæ.* 7. *Succus Hypocystidis.*

1. *G. Arabicum.*

Gummi Arabicum. Gum arabic is a whitish, transparent gum, without taste or smell, which easily dissolves in water; it issues from the tree called *Acacia vera*, and by Linnæus *mimosa Nilotica*; and in English the Egyptian thorn, or true acacia, and is the same which furnishes the succus acaciæ.

The gum dissolves entirely in water, crackles in the fire, and then flames briskly. It is a mild, incrassating medicine, which

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assists in thickening the juices, and in correcting their acrimony, and supplies matter for the generation of a fine lubricating mucus; hence it is used in coughs, and other diseases of the breast, from thin acrid fluids; in cases of women after child-birth, where the lochia are too thin and acrid; in gripes and pains of the belly; from the natural mucus of the intestines being abraded; in heat or pain in making water, either from gravelly complaints, or from a virulent gonorrhœa, or from the urethra being inflamed or irritated, or being deprived any how of its natural mucus; or from the urine being too sharp or acrid.

It is used for incorporating oils, balsams, and resins with water.

As the following inspissated juice is produced from the same tree as the gum arabic, I shall mention it here.

2. and 3. *Succus Acaciæ* and *Succus Hypocistidis*.

The unripe fruit of the same tree which yields the gum arabic, affords, by expression, a juice which, when inspissated to the consistence of a hard extract, is of a blackish, or very dark reddish colour, of an austere,
astring-

astringent taste, joined to an agreeable acrimony, and is brought to Europe in bladders. It is used in Egypt in diarrhoeas and dysenteries, and for stopping uterine and other hæmorrhages; and was formerly given for the same purposes in the western parts of Europe; but now it is very difficult to get it genuine; *Geoffroy* says, that it is common to substitute the inspissated juice of the *acacia Germanica*, for which reason it is now seldom called for. And the *succus hypocyssidis*; which is an astringent inspissated juice of the same kind, got from the fruit of the *cytinus hypocistus* tree, which grows in the south of France, and the East Indies, is now thrown out of the pharmacopœia.

4. *Gummi Cerasorum.*

The *gummi cerasorum*, or gum which transudes through the cherry-tree, is nearly of the same nature as the gum arabic, and may be used for most of the same purposes.

5. *Gummi Senega.*

This is a gum brought home from the coast of Africa, which resembles

the gum arabic very much, and is often fold for it, and used in the same manner; but it is reckoned to be inferior to the true gum arabic for medicinal purposes.

6. *Gummi Tragacanthum.*

Gummi Tragacanthum, Gum dragant, or dragon is a hard, rough, semi-pellucid gum, or concreted mucilage, commonly brought to England in pieces twisted and curled up like worms, of different shapes, sizes, and colours; it has a mucilaginous insipid taste, and no smell.

It issues from the root, trunk, and branches of a tree called *tragacantha Massiliensis*, by J. B. and by Linnæus *astragalus tragacantha*; and in English *goat's thorn*; it grows in the South of France, Italy, &c. but the gum is brought from Turkey, and imported from Aleppo and Smyrna.

It is much more mucilaginous than the gum arabic, for a dram of it will give a pint (sixteen ounces) of water the consistence of a syrup, where a dram of the gum arabic will dissolve in less than two ounces

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of water, without rendering it visibly
ropy.

It is used for the same purposes as the other gums, but is much more incrassating. It has been much employed for making troches or lozenges; and there is a formula of this kind in the pharmacopœia, in which three ounces of this gum are made up into lozenges with ten ounces of sugar, and as much extract of liquorice.

The infusions and decoctions of the althea, malva, and other mucilaginous plants, are a good deal of the same nature as the solutions of those gums, and are used for the same purposes.

The two following glutinous or mucilaginous substances, of an animal nature; the *ichthiocola*, and *jelly* made from hartshorn, were formerly used (though improperly) in the same manner as the gums, and therefore I shall mention them here, though they do not belong to the same class of substances as those I have been just now treating of.

Ichthiocola.

The *ichthiocola*, or ising-glass, is a viscid

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cid glutinous substance prepared from the skins of fishes, which formerly was much employed for making mucilaginous liquors, in the same manner as the gums; but it is of an animal putrescent nature, and is not so much prescribed by physicians as formerly; though it is still very much used by the women as a remedy for the fluor albus, and other uterine discharges; and slight solutions of it are sometimes given to weak people, as a mild nutritive animal food.

2. *Gelatinum Cornu Cervi, &c.*

Jellies made of hartshorn, and of calves feet, are likewise of a mucilaginous animal nature, and are used as a restorative diet for weak people; especially when mixed with a little lemon juice, or with wine, to correct their putrescent nature. They may be safely administered where there is no fever, nor any indication to forbid the use of light animal food.

C H A P. XIV.

*Of SUGAR, and SACCHARINE
SUBSTANCES.*I. *Saccharum.*

Saccharum, Sugar, is the saponaceous matter which gives the sweet taste to all vegetable substances, and is the subject of all fermentation. What is now used is the expressed juice of the sugar-cane, purified and inspissated. When it is perfectly pure it is white, and somewhat transparent; and has every appearance of a salt. It dissolves entirely in water, without making it lose its transparency; and it may be dissolved, but with difficulty, in spirit. In distilling sugar there first comes over a quantity of a watery phlegm, which gradually becomes more and more acid, and of a deeper colour; and at last a small quantity of a black oil; and there remains in the retort a large quantity of solid matter, commonly called caput mortuum, which, on being taken out and burnt,

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burnt, yields an alkaline salt, and an earth. Hence we see that it contains the same principles as resins, but in different proportions; for the resins only afford a small quantity of a watery phlegm, and a much greater quantity of oil, than of acid; and what remains in the retort, after the distillation is over, if burnt, leaves little or no fixt alkaline salt behind. From the principles obtained in analysing sugar, one may conclude that it is a sort of middle substance between the resins and gums, containing less oily or inflammable parts than the resins, but more than the gums; and hence, if thrown into the fire, it flames less than resin, but more than gum.

Sugar may be considered as a saline, saponaceous body, which has an acid instead of an alkaline salt for its basis; and by being triturated with essential oils and balsams, it renders them miscible with water; it is soluble by the animal juices, and is of great use when mixed with our drink, in breaking down and resolving viscid and oily particles in the blood; it is likewise a strong antiseptic, and is found to be a good remedy
for

for preventing the scurvy and other putrid diseases; and is now given out as part of the provision to the seamen of his Majesty's navy, for that purpose. It is likewise of great use in putrid disorders when already formed, by correcting the too great tendency of the blood to putrefaction.

It is much used in common life, mixed with our food, and with our drink, on account of its sweet agreeable taste, and the wholesomeness of its nature; and in medicine, on account of its saponaceous, detergent, and antiseptic qualities.

It enters into several compositions of the Pharmacopœia; and a variety of syrups are ordered to be made with it and water; into which balsamic, cordial, and other medicines enter as ingredients; and these syrups possess the virtues of sugar, joined to those of such parts of the other substances as are soluble in syrup.

The juice of the sugar-cane, when only freed in part of its mucilaginous and oily principles, forms a sugar of a yellowish brown colour, which is commonly called coarse or brown sugar. In this state it is of a
more

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more aperient and laxative nature, than when it is refined a second time, and freed of most of its impurities : it is employed for many purposes ; and in medicine it often enters as an ingredient into clysters, on account of its mild laxative quality.

What remains of the juice of the sugar-cane, after the sugar has been separated from it, if mixed with water and fermented, yields on distillation that sort of ardent spirit called rum, which is imported yearly in large quantities into this country, from the West-Indies.

It is sugar which is the subject of all fermentation, and gives the sweet taste to all sorts of vegetable substances ; and it may be extracted from a great variety of them ; but the sugar-cane yields it in greatest quantity, and it is found to answer best to prepare it from thence. In the province of Canada, in North America, a quantity of sugar is prepared every year from the juice of the great papple-tree, the *acer majus officinarum*, called by *Linnaeus*, in his *Species Plantarum*, *acer plantanoidea*.

2. *Mel.*

2. *Mel.*

Mel, Honey is the saccharine juice of flowers and plants collected by the bees; and has a different flavour, according to the different flowers it is got from.

Like sugar it dissolves in water; and by distillation yields nearly the same principles, a watery phlegm, an acid, and a small quantity of oil; and leaves a solid matter behind, which, on being burnt, affords a fixt alkaline salt.

It was used for the same purposes as sugar, before the sugar-cane was so much cultivated, and the method of making sugar so well known; and by art, sugar may be separated from it.

Honey contains a good deal of a viscid mucilaginous juice, mixed with the saccharine; it is of a saponaceous, detergent nature, and has been much used in diseases of the breast, particularly in coughs and asthmas, in order to resolve the viscid humours, and to promote the expectoration of tough phlegm. It increases the watery secretions by the kidneys and the skin; mixed with water
and

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and vinegar, it was used by the ancients in the cure of the most acute diseases, under the name of hydromel.

If taken in large quantity, it generally proves laxative; it agrees with most people, though it occasions violent gripes and cholick to some.

The following are remarkable instances of the good effects of honey in some asthmatic cases. The late Dr. John Hume, one of the commissioners of the sick and hurt of the royal navy, was for many years violently afflicted with the asthma: having taken many medicines without receiving relief, he at last resolved to try the effects of honey, having long had a great opinion of its virtues as a pectoral; for two or three years he ate some ounces of it daily, and got intirely free of his asthma, and likewise of a gravelly complaint, which he had long been afflicted with. About two years after he had recovered his health, when he was sitting one day in the office for the sick and hurt, a person labouring under a great difficulty of breathing, who looked as if he could not live many days, came to him,
and

and asked him, by what means he had been cured of his asthma? Dr. Hume told him the particulars of his own case, and mentioned to him the means by which he had found relief. For two years after he heard nothing of this person, who was a stranger to him, and had seemed so bad that he did not imagine that he could have lived many days, and therefore had not even asked him who he was; but at the end of that period, a man, seemingly in good health, and decently dressed, came to the Sick and Hurt Office, and returned him thanks for his cure, which he assured him had been intirely brought about by the free use of honey. I have known a number of people who have taken honey for asthmatic complaints, some of whom have received benefit, others found no relief from its use. Light infusions of lin-seed, or of the leaves of the malva, or other weak liquors, sweetened with honey, make good drinks for people troubled with coughs, and other complaints of the breast.

Most dispensatories have preparations into which it enters as an ingredient.

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Honey, when clarified and mixed with vinegar, in the proportion of three parts of it to two of vinegar, and boiled to the consistence of a syrup, has been called *oxymel simplex*; it has been used as an attenuating pectoral in coughs and asthmas, and as a good antiseptic for sweetening drinks of patients labouring under fevers and putrid diseases.

When mixed in the same proportion with the vinegar of squills in place of common vinegar, and boiled to the consistence of a syrup, it has been called *oxymel scilliticum*; which is much used as a pectoral in coughs and asthmas, and as a diuretic in dropsies, and in other disorders, where there is a stoppage of urine. It is given as a pectoral, or diuretic, in doses from a scruple to two drams; if these doses are often repeated, it operates by stool. If given in larger doses, it occasions sickness and nausea; and it has frequently been employed as an emetic, given from half an ounce to two ounces.

It has frequently been used to unite
oils

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oils with watery liquors; and it is often mixed with castor oil, to render that oil more palatable to children.

Honey has a viscosity in it, and at the same time contains a good deal of an acid, so that it unites with, and extinguishes, the globules of quicksilver, when triturated in a mortar with it; and has therefore been often used to make mercurial pills with.

It has been mixed with various other substances; and the mixture has been called honey, joined to the name of the substance with which it has been united, as, *mel elatines*, *mel belleboratum*, *mel rosaceum*, &c.

3. *Extractum Glycyrrhizæ.*

Extract of liquorice-root is commonly kept in a dry solid form, and is of a black colour, and a sweet particular taste; it is made up mostly of gummy and saccharine parts, with a very small portion of resinous. It dissolves entirely in water.

It is principally made use of as a saponaceous, resolving, emollient pectoral medicine, and prescribed for many of the same complaints as sugar and honey. It is an excellent

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remedy in coughs, from a sharp tickling rheum; and in other cases where the juices are too sharp and acrid.

It covers the taste of most bitter substances; and therefore it is often mixed with decoctions, or extracts of the bark, or with other bitters, when they are offensive to the palate, or to the stomach; and it has been mixed with tinctures, and with pills made of aloes, both to cover their taste, and to make them operate with greater ease to the patient.

4. *Manna.*

Manna. Manna Calabrina. Manna is a concrete juice, of a whitish or pale-yellow colour, and of a sweet but somewhat sharpish taste, which flows spontaneously, or from incisions made into the *fraxinus rotundior folio*, B. P. the round-leaved, or manna ash, in the months of June and July, or August. It grows in Calabria, and in other parts of Italy, and in Sicily. Dr. Alston says, that it is also got in these countries in the same manner from the *fraxinus humilior*, called likewise *ornus vulgaris fructifera*.

It has been alledged, that it has been sometimes

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times counterfeited, and prepared from sugar or honey, with the addition of scammony, or of some other cathartic medicine.

Tournefort, in his *Materia Medica*, tells us, that the manna which drops spontaneously from the trees, is called by the Italians *manna difronda*, from its dropping from the leaves; but that that which flows from incisions made into the bark of the tree, *manna sporsatolla*, or *manna dicorpa*. And he says, that that manna is best which is fresh and light, has a white colour, inclining to be a little brown, and which when its clots or lumps are broken, look as if they were sprinkled with syrup.

It is a soft, sweet substance, which is entirely soluble in water; and from one to three ounces of it, dissolved in any mild liquor, generally proves laxative; and if crystals of tartar, and a small quantity of cinnamon water be added to its solutions, it renders them more pleasant.

It is often mixed with solutions of the Rochelle, or Glauber, or other purging salts, to render their operation milder. And it has been a common practice to order one
or

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or two ounces of manna to be dissolved in a pint of almond emulsion, and to add to it from two drams to an ounce of soluble tartar, or of Rochelle salt, and an ounce of some spirituous water; and to make the patient take from two to four ounces of this emulsion, every hour, till it operates by stool. When a stronger purge is wanted, an ounce of tincture of fenna is added in place of the spirituous water.

Manna is sometimes made up with oils and syrup into a linctus, or into an electuary, with the addition of magnesia, to serve as a mild eccoprotic. If castor oil (*oleum ricini*) be employed in place of oil of almonds, it makes such preparations more laxative. If in preparing such linctuses, one or two blanched almonds be triturated with a very small quantity of water, till they be reduced to a pulp, and the oil be then added and triturated with the almond, and afterwards separated by straining before it is mixed with the manna, it gives such linctuses a beautiful white colour.

5. *Cassia Fistularis Pulpa.*

The pulp of cassia is of a black colour, of a sweet subviscid taste, and soft smell; it surrounds the seeds of the *cassia fistularis* tree, which are placed in the cells of the slender dark brown pods which are two or three feet long, and are the fruit. The tree is called by Linnæus *cassia fistula*.

The pulp is got by breaking the long pods, and scraping the seeds, pulp, and divisions of the cells out of them with a knife, and then boiling them in a sufficient quantity of water, and straining the liquor through a cloth or sieve, after the pulp is dissolved, and boiling it up to a proper consistence.

This pulp is given by way of a mild eccoprotic, or laxative, from half an ounce to an ounce; it is much used by pregnant women to prevent costiveness.

It enters as an ingredient into the *electuarium e cassia*, which is a mild laxative medicine; and into the *electuarium lenitivum*, which is an electuary of the same kind, but stronger.

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